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Train-Despatching in an Automotive-Parts Shop

By R. S. Spencer

Production Manager, Timken-Detroit Axle Co.

Railroad train-despatching methods applied to inter-departmental traffic—Putting material handling on a definite job basis—A good answer to the shop transportation problem

THE problem of inter-departmental transportation of materials is one that has never been satisfactorily solved, if one can judge from the difference in the methods employed in various plants throughout the country. The items of materials, machinery, cutting tools, power, etc., are all more or less tangible, problems that can be solved scientifically, but the problem of how materials shall be transferred from one department or building to another, what kind of conveyance shall be used, how many men are needed to take care of the work to be done, etc., is one that can not be solved with the aid of a slide rule. In many otherwise progressive plants, the handling of materials is done mostly by laborers, using hand-trucks, sometimes supervised by the foremen of the various departments in which they are stationed, sometimes supervised by a trucker foreman who tries desperately to keep tab on his gang by walking about, censuring anyone who may have found something with which to give his truck the appearance of industry. The development of the power shop-truck has done much to alleviate this condition, and it now remains for the utilization of some such system as the one described here to bring the efficiency of this department up to that of the rest of the shop.

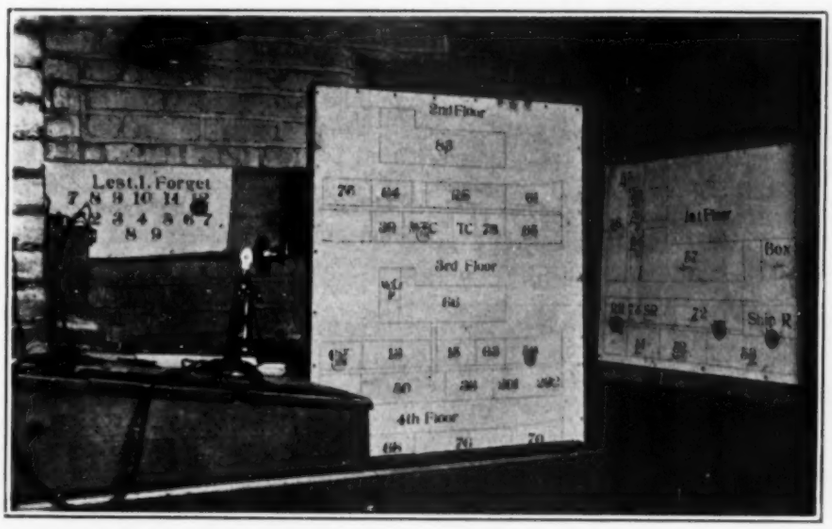


Fig. 1—Trucker despatcher's office

The Timken-Detroit Axle Co., Detroit, Mich., employed approximately 250 men to handle materials about the plant, most of them being assigned to the various departments and practically all using hand trucks. The time came when an electric truck was purchased, which made it possible to dispense with so many of the hand trucks that the latter were finally discarded entirely and a fleet of 14 electric trucks was purchased, this number having since been reduced to nine. In endeavoring to find a means of controlling the operation of the trucks to the best advantage it was decided to adopt the best system in use today — the despatching system used by the railroads. To this end a station was selected as near the center of the shop as possible and a despatching board erected as shown in the illustration, Fig. 1. On the board is listed the number of each department of the shop, and under the number is a hook. Two sets of small round disks were made up, one set bearing the numbers of each of the truck operators, the other bearing the numbers of the departments. The installation of a telephone completed the equipment. Whenever it became necessary to have material moved

from a department, the foreman of that department calls the trucker despatcher and informs him of the fact. The despatcher sends a truck to take care of the job and immediately hangs the disk bearing the trucker's number on the hook under the number of the department to which the material is to be delivered. At the same time he records, on the form shown in Fig. 2,

TRUCKING REPORT

From Department	To Department	Time Called	Time Delivered	Truck No.	Remarks
73	207	7 15	7 30	18	
63	47	7 15	7 25	21	
71	57	7 15	7 30	17	
60	207	7 15	7 35	22	
68	207	7 15	7 35	22	
Main Crib	Tool Cribs	7 20	7 30	19	
83	74	7 20	7 35	20	
57	74	7 25	7 35	23	Drums
72	76	7 25	7 40	21	
65	68	7 30	7 45	24	
83	H.T.	7 30	7 52	26	
R.G.	62	7 35	7 50	22	
57	207	7 40	7 55	21	
56	63	7 50	8 15	19	
83	207	7 55	8 40	26	3 Loads
73	54	7 55	8 15	23	
Misc. Stock	54	7 55	8 20	24	
53	74	8 00	8 15	26	
54	57	8 00	8 15	22	
53	71	8 10	8 30	21	
51	65	7 50	8 10	20	
73	71	7 50	8 05	18	
202	71	8 10	8 20	17	
70	61	8 10	8 30	20	
61	55	8 15	8 30	26	Fixtures
41a	66	8 15	8 45	23	
52	206	8 15	8 30	18	

Fig. 2—Record of trucking service

the number of the department in which the material is located, the number of the department it is going to, the number of the trucker assigned, and the time he started. The trucker picks up the material, delivers it to its destination and then calls the despatcher and reports. If in the meantime, the foreman of some other department has called for a trucker, he immediately assigns this trucker to the call and records it accordingly. If no request for service has been turned in, he orders the trucker back to the despatching office. Thus the material gets moved in the order in which the calls come in and the despatcher knows at all times exactly where each man is and what he is doing. The men are under strict orders not to take instructions from anyone except the despatcher, not excepting the works or production managers.

Fig. 3—One of the nine trucks that replaced 250 men with hand trucks

The management has no intention of encouraging the kind of initiative that made excellent copy for writers of war stories in which "go-getter" subalterns commandeered trucks or railroad trains to get material moved in back areas while the front swore impotently. In the stories little is said of the dire results of such performances. In the shop things are different.

While it would be possible simply to list the numbers of the departments, which would save space, the board shown bears a complete layout of the shop buildings, with the number of the department stamped on the layout in the proper position so that the department can be instantly located. This gives the despatcher an idea of the general location of the various departments, proximity to each other, etc., all of which is necessary to the proper handling of the work. We will assume that a call comes in for service in department No. 63. Reference to the board will show that a man has been assigned to deliver material in department No. 59. A record of the call is made and the despatcher then waits until the man calls from department No. 59, at which time he gives him instructions to report for material in department No. 63. In this manner every man is kept busy, the material is kept moving, and the work is assigned so that lost motion is eliminated as far as possible.

A Time-Table Chart

Over the despatcher's desk can be seen, by reference to Fig. No. 1, a chart that bears the legend "Lest I Forget." It also bears the numerals, 7, 8, 9, 10, 11, 12, 1, 2, 3, 4, 5, 6, 7, 8, 9, indicating the hours of the day. This chart is used by the despatcher for recording an order for future service. For instance, if the foreman of the hardening room telephones that he wants a trucker on hand at 4 o'clock to remove some material, that being the hour at which it will be properly cooled off and can be handled, the despatcher picks up the disk which bears the number of the hardening department, and hangs it on the hook over the figure 4. Thus he knows at all times when service is going to be wanted in any certain department at some future time and can make preparations to take care of it accordingly.

The system described is used throughout the plant with the exception of the departments that have been found to require the services of one man continuously, such as the receiving room and shipping room. When it is found that there is enough material handling in or from any one department to require the entire services of one man, a man is assigned to this department and left there. This not only saves the time of truckers traveling back and forth between the despatching office and the department in question, but makes for efficiency as the trucker will handle the job better as he becomes familiar with the requirements of that particular department. If one man is unable to handle all the work in the department, calls will soon be coming in from this department for additional service, and if the despatcher keeps himself posted as to conditions about the plant, he will generally know when work is slack enough in that department so that the time of the man can be used elsewhere a part of the day.

Fixtures for Boring and Testing Locomotive Rods

By Fred H. Colvin
Editor, *American Machinist*

Some of the methods and tools used by the Lima Locomotive Works in boring and testing side rods of plain and articulated types

THERE is quite a diversity of practice in the making of locomotive main and side rods, depending on the facilities afforded by the shop and the ideas of the men in charge. The forging, the cutting of the outline of the rods with oxy-hydrogen—or of milling to shape from the rough forging, are matters of individual preference. The effect of the flame on the metal is still in dispute, in spite of what seem to be conclusive tests. Then, too, the introduction of alloy steels for main and side rod use brings new problems into consideration.

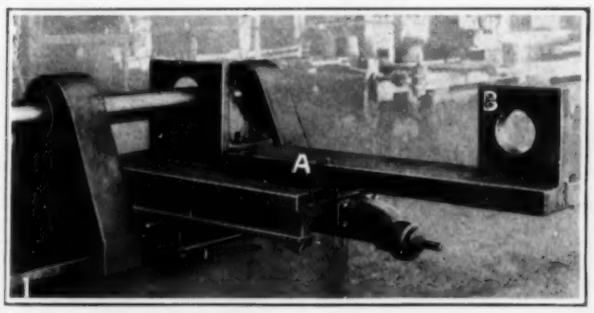
The fixtures and methods shown herewith represent the practice of the Lima Locomotive Works in boring and testing rods. The type of fixture used in boring the main crankpin holes is shown in Figs. 1 and 2, the work being done on a horizontal boring machine. Two different makes of machines are shown, but the fixtures are of the same type in each case.

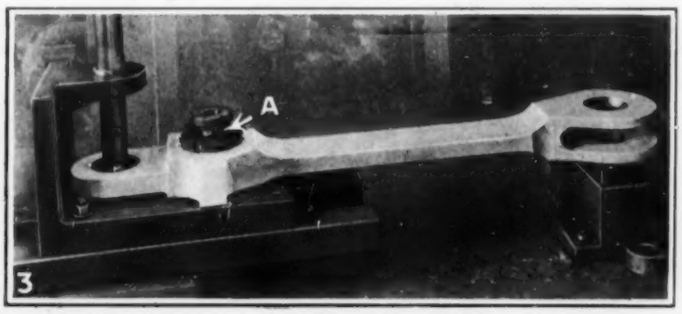
The fixture consists of a substational base *A*, with an upright at *B*. There is also an angle plate on the table and the rod is clamped to both it and the upright. The boring bar is supported in two rigid bearings and feeds through these bearings as it bores. The rod remains stationary.

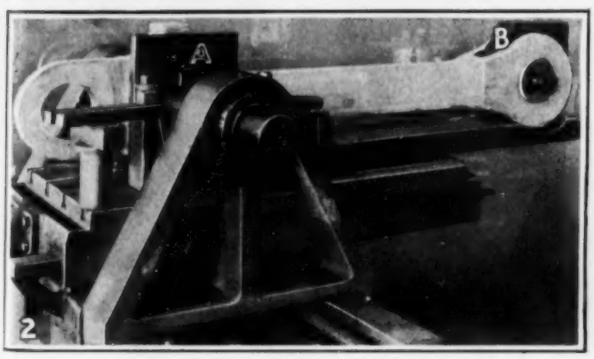
An empty fixture is shown in Fig. 1, while in Fig. 2 is shown a side rod being bored at one end. The rod has been painted white for laying out the holes and outlines. The block *A* can be moved sideways to accommodate different thicknesses of rods, while *B* can be used to support the forked, or spade ends of articulated rods as in Fig. 2, where the spade end is held in position by a pin or mandrel.

Another type of fixture, shown in Fig. 3, is for boring the articulated rods. The main hole is located by means of the expanding mandrel at *A*. The boring bar is guided at both top and bottom. The other end of the rod is supported by blocks as shown.

Two similar fixtures on a double-spindle drilling machine are shown in Fig. 4, holding a rod having a single projection at each end. Both the main bores







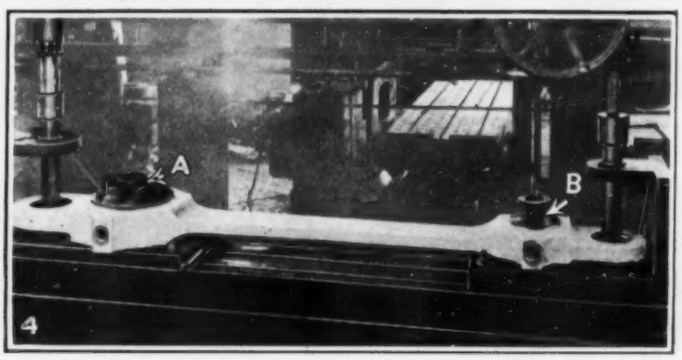
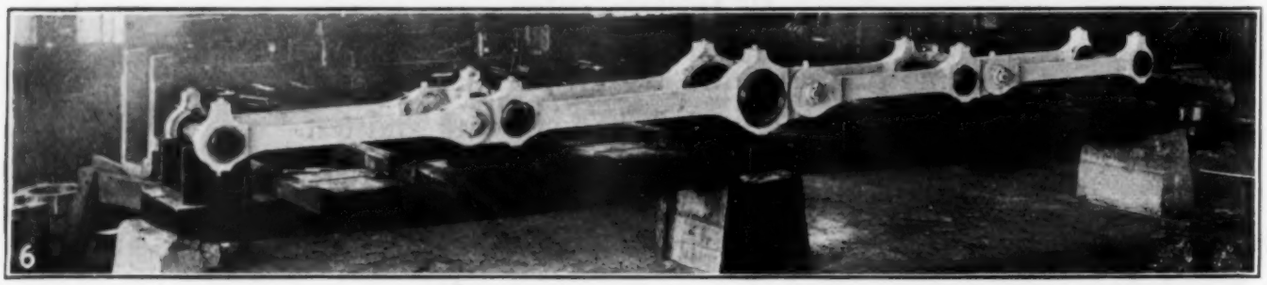
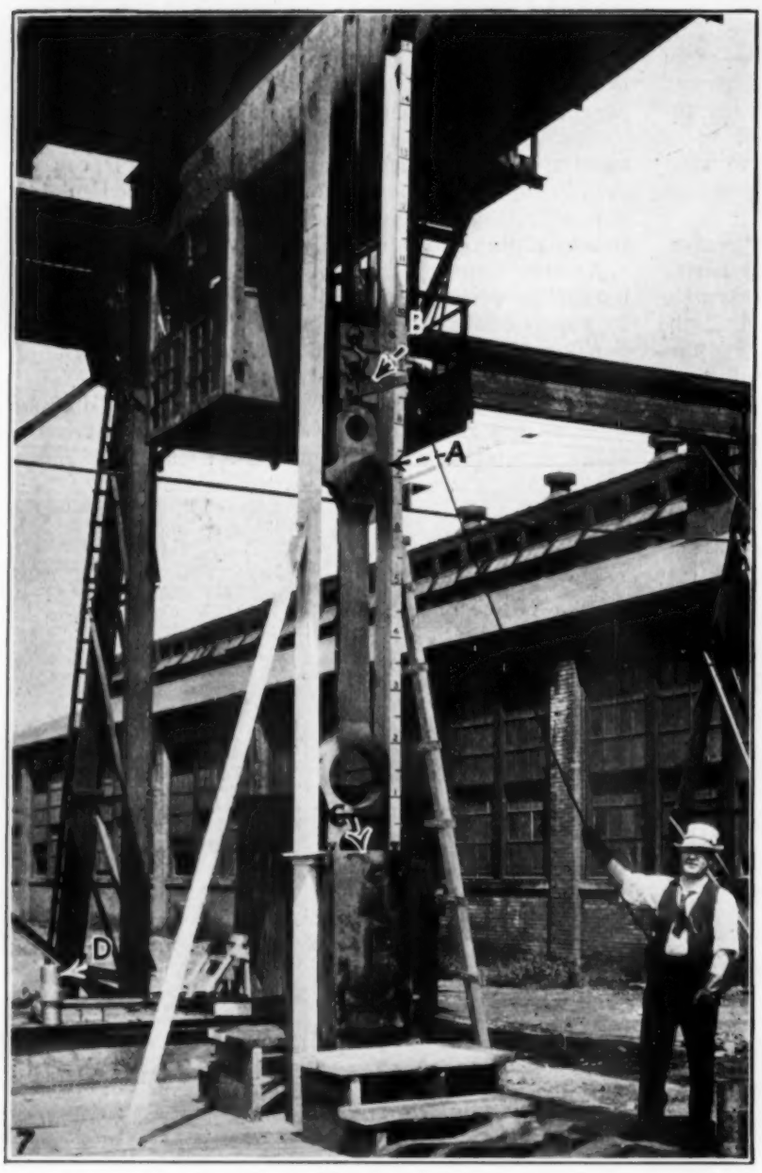


Fig. 1—Fixture for boring main pin hole. Fig. 2—A rod being bored. Fig. 3—Boring the end hole. Fig. 4—At work on both ends





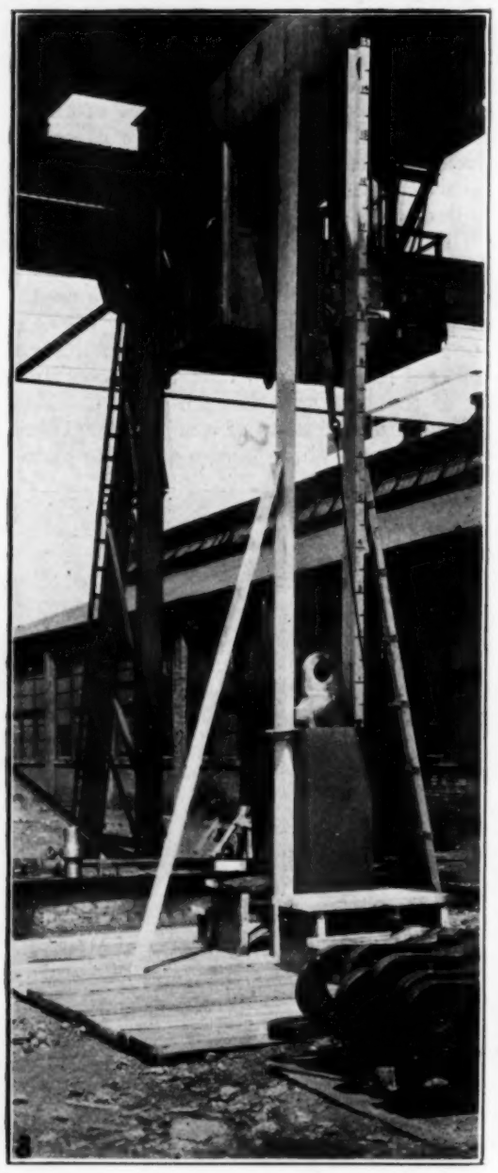


Fig. 5—Fixture for testing a set of rods. Fig. 6—A full set of rods in place. Fig. 7—Rod hoisted for drop test. Fig. 8—After the drop

are located by the mandrels shown at *A* and *B*, and the fixtures guide the boring bars at the correct center distance.

After the rods are bored they are inspected by testing on the fixture shown in Fig. 5, which represents all the crankpins of a complete locomotive. The fixture base, mounted at a convenient height on concrete piers, has a T-slot in the center so that the various pin, or mandrel supports, can be adjusted to any center distance to correspond with the locomotive in which the rods are to be used. Between each pair of mandrels are two stout cross bars of hard wood, to support the rods while they are being put in place on the dummy crankpins.

A complete set of rods for a decapod, or ten driver locomotive, is shown mounted on the testing fixture in Fig. 6. This set-up tests not only the crankpin holes but also the position and line-up of the three auxiliary or articulating pins in each set of rods.

In order to know that the material used in the rods is satisfactory, the plant manager, Wm. Reid, devised the drop testing machine shown in Figs. 7 and 8. A sample rod is taken for the test and a dummy crankpin inserted at *A*, Fig. 7. The rod is then lifted by the crane to any desired height, and released by means of the trip rope and the catch at *B*. The rod drops so that the dummy pin strikes the anvil at *C* and subjects the eye of the rod to the desired shock or stress. The guideways consist of two channels, graduated up to 15 ft., and allow for any desired drop. The other end of the rod can be tested in the same way, one of the dummy pins being shown at *D*. Fig. 8 shows the rod after dropping, with the pin resting on the anvil. The construction of the hook that holds the rod while it is being hoisted may also be seen. The drop test has proved very successful in determining the strength of the alloy steels now being used in locomotive rods.

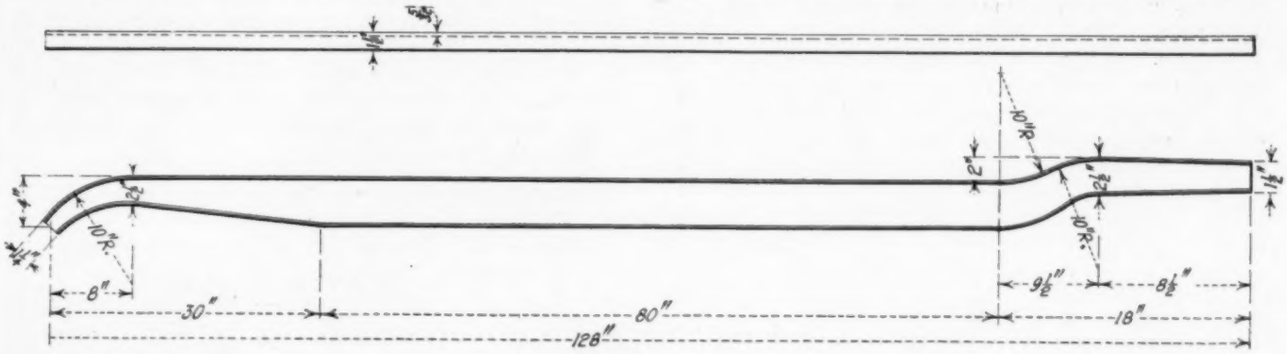
Drawing Tools for Automobile Side Rails

By P. Baldus

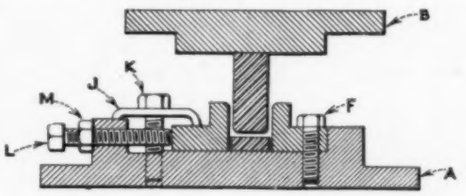
AN ORDINARY form of automobile side rail with a rear kick-up is indicated in Fig. 1, and the drawing tools used for its production are shown in detail in Fig. 2. Work of this kind is frequently done in a heavy type of hydraulic press, or in one of the heavier types of mechanically-operated drawing presses provided with a knock-out arrangement.

The drawing tools proper are assembled in the cast-iron die shoe *A*, which is securely attached to the bolster of the press, and the different punch sections are mounted on a cast-iron punch holder *B*, which is fastened to the press ram by means of fillister-head screws. The back die walls *C*, *D* and *E*, are of cast iron and are held in place by the 1-in. hexagon-head screws, *F*, the number of screws depending upon the length.

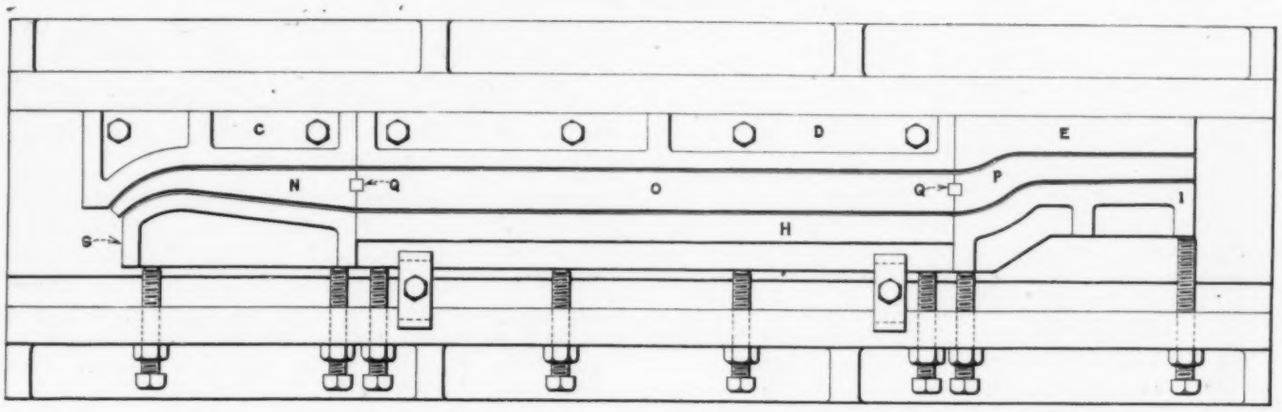
The front die walls, *G*, *H* and *I*, are also made of



Above—Fig. 1—Ordinary form of automobile side rail



Below—Fig. 2—Drawing tools for ordinary side rails



cast iron, well ribbed to withstand the pressure to which they are subjected, and fastened with the cast-steel clamps *J*, and the hexagon-head cap screws *K*. It is necessary to have these front walls adjustable and the 1-in. square-head setscrews *L*, are used for this

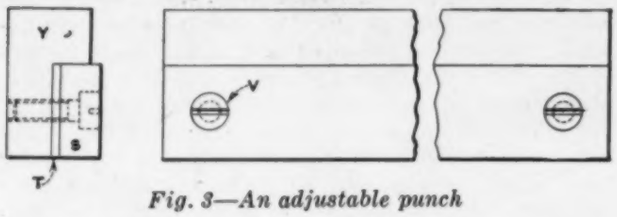
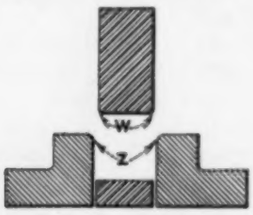


Fig. 3—An adjustable punch

purpose. These screws are locked, preferably with the hexagon locknuts, *M*. Tapped holes for the setscrews are spaced evenly along the die shoe, about 2 in. apart, permitting the proper location and number of screws to resist the drawing pressure. The number and location of the clamps and screws necessary to hold the



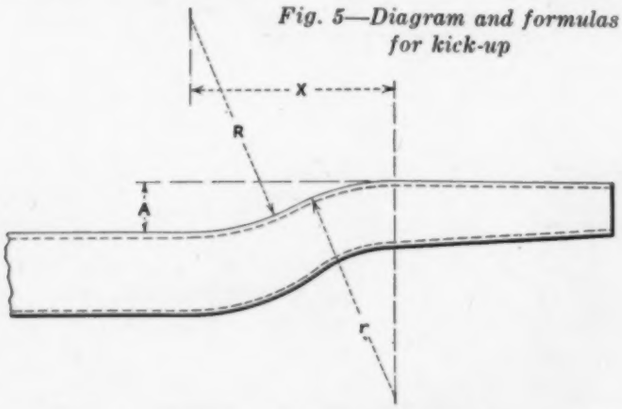
Draw Edges for Side Rails and Cross Bar Dies	
Thickness of stock	Radius z of die walls
and over	

Fig. 4—Radii for drawing edges of punch and die

front die walls down, depend upon the size of the work to be done.

The punch sections *N*, *O* and *P*, are usually of cast steel and are lined up with 1-in. square keys as indicated at *Q*. The front and rear parts of the punch sections are generally made solid, whereas the center section is usually made adjustable. Such an adjustable

Fig. 5—Diagram and formulas for kick-up



Formula 1: $X = \sqrt{4RA + 2A^2}$

Formula 2: $X = \sqrt{2AR + 2Ar - A^2}$

center section is illustrated in detail in Fig. 3. It consists of the punch holder *Y*, the punch lining *S*, and the shim *T*. All these parts are made of machine steel and held together with the fillister-head screws, *V*. It is evident that this construction permits the punch to be used for many different sizes of rails, as well as for straight cross rails, by merely changing the shim *T*, so that the punch will fit the new rail.

It is desirable to make the radii of the working edges, *W* Fig. 4, of the punches equal to the thickness of stock used. When drawing the metal across the edges of the die walls, the thickness of metal makes considerable difference in the size of the radius which can be used to advantage. The table and diagram shown in Fig. 4 give the proper draw-edge radii of die walls for various thicknesses of stock in common use. In Fig. 5 is shown the rear end of the side rail, and two formulas for determining the proper dimensions between the two radii and the kick-up. The first formula gives the dimension for *X* if both radii are alike and the second, the dimension for *X* if both radii are different.

Book Reviews

Elementary Machine Shop Practice, Vol. 11. By Committee on Industrial Education, National Metal Trades Association. One hundred twenty-eight pages 5½x6½ in. Illustrated with line drawings. Published by the National Metal Trades Association, Chicago, Ill. Price $1.

Like its predecessor, Vol. I, this little book is intended for men in the shop who are preparing themselves for an allround knowledge of the machinist's trade. It is not exhaustive but it does give an excellent idea of the general principles of design and methods of operation of some of the more complicated machine tools. The first tools described are the various types of turret lathes and automatic lathes. Then follow the horizontal boring machine, the vertical boring mill and the thread milling machine. A chapter is devoted to machine grinding in general and there are separate chapters on tool and cutter grinding, cylindrical grinding, internal grinding, plane surface grinding and centerless grinding. At the end of the book is a very complete bibliography of source material and other books on machine shop practice.

Factory Management. By Henry Post Dutton, B.E.E. Three hundred twenty-nine pages 5½x7 in. Illustrated with charts and diagrams. Published by the MacMillan Co., New York. Price $2.75.

It is probably impossible to condense into three hundred pages a comprehensive study of factory management that will be of real value to the man engaged in that sort of work. Professor Dutton does not attempt to do so in his book which is intended as a textbook. To the student this book should give an excellent picture of the complete factory organization from financial control to personnel direction. It should also serve to educate the specialist in one particular phase of factory administration in the basic principles of the other departments that must be co-ordinated with his own.

At the end of each chapter is a list of reference books on the subject covered by the chapter. A set of problems, fifty in number, is placed at the end of the book. They refer to the various problems encountered by a mythical bedspring manufacturer and are classified under the chapter headings.

The Story of Bakelite. By John Kimberly Mumford. Eighty pages, 5½x7 in. Illustrated. Published by Robert L. Stillson Co., New York. Price $1.

Space is given here to what is essentially an advertising booklet because it is so excellently written and printed. It is so interesting that we venture to predict that the casual reader will do as we did if he starts to read—continue until he finishes.

Development of Machine Tools in New England

By Guy Hubbard

The eighteenth article—The Lamson Companies—Revival of the rifle industry—Formation of the Jones & Lamson Machine Company—Its removal from Windsor to Springfield

IN MAY, 1665, Joseph Jenks, the pioneer iron master of Lynn, Mass., was granted a patent upon an improvement in scythes, which consisted in making the blade long and thin, and welding to the back a bar of iron to strengthen it.

While this invention brought into being the modern scythe blade, either straight or naturally bent handles continued to be used, and it was not until 1824 that Silas Lamson of Sterling, Mass., a very eccentric hill farmer and inventor, whose portrait is shown in Fig. 124, conceived the idea of steaming and bending to a predetermined shape, the poles used with the Jenks scythe—and thereby created the modern scythe snath.

Silas Lamson and his six sons immediately began the manufacture of these bent scythe snaths, and as the business grew, they set up a factory in Shelburne Falls, Massachusetts.

The youngest son of Silas Lamson, Ebenezer G. Lamson, see Fig. 125, was not long content to limit his activities to the manufacture of scythe snaths, so in 1842, he founded a cutlery factory at Shelburne Falls, a view of which is given in Fig. 126. In 1844, his uncle, Abel F. Goodnow, joined him in this venture. Under the name of Lamson & Goodnow, and starting with forty men, this concern built up within a few years a plant covering seven acres—which was for many years the greatest cutlery plant in the United States.

Ebenezer G. Lamson first became interested in the machine business through the development of numerous special machines for the quantity manufacture of cutlery at Shelburne Falls, and, as an outside enterprise, he began the buying and selling of machinery and of entire manufacturing plants on speculation. Thus it happened that, in 1858, when Col. Henry Sebastian Rowan put up for sale the plant and equipment of the Robbins & Lawrence Co. at Windsor, the firm of Lamson, Goodnow & Yale—consisting of Ebenezer G. Lamson, Abel F. Goodnow and B. Buchanan Yale—were the purchasers, paying but a fraction of the actual value, as the gun business was temporarily dead and the peaceful condition of the country indicated that there would be no likelihood of its revival in the near future.

As has been mentioned in a previous chapter, the Vermont Arms Co. had been organized at Windsor in 1856, after the failure of the Robbins & Lawrence Co. and had leased the Windsor armory to carry on the work of finishing the uncompleted Enfield rifles, and to develop

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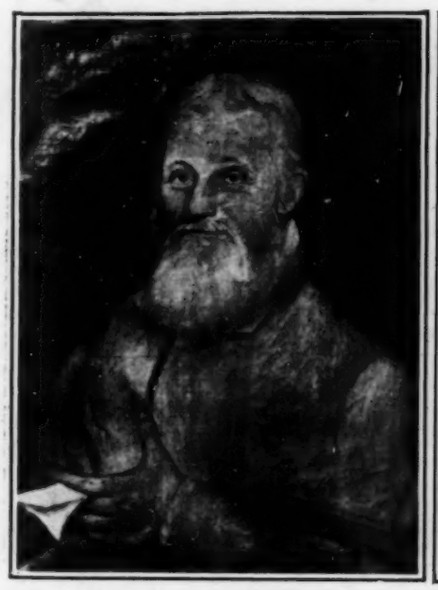


Fig. 124—Silas Lamson

Fig. 125—Ebenezer G. Lamson

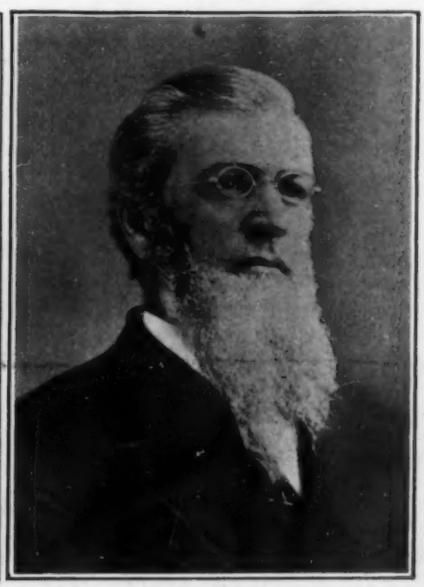


Fig. 129—Russell L. Jones

Fig. 126—Cutlery works of the Lamson & Goodnow Manufacturing Co., Shelburne Falls

a new sewing machine. The working force of this company was made up of several of the skilled Robbins & Lawrence workmen, under the superintendence of Henry D. Stone.

Mr. Lamson was arranging to build sewing machines on a large scale at the Windsor armory, when the civil war broke out.

A large force of mechanics was immediately set to work repairing the gun machinery, and overhauling the Robbins & Lawrence patterns, while Mr. Lamson hastened to Washington, where, in the name of Lamson, Goodnow & Yale, he took a government contract for 50,000 Springfield rifles, and for a large number of machines for the government armories. As may be supposed, every mechanic of this reawakened industry was vitally needed upon the manufacture of guns and gun machinery. As a consequence the sewing machine business was entirely discontinued and Mr. Lamson decided to sell it out. In connection with the disposal of a small cutlery plant at Deerfield, which he had purchased on speculation, Mr. Lamson, in 1858, is said to have become acquainted with a young man by the name of Thomas White, who in partnership with Samuel Barker, had just begun the manufacture of the so-called Brattleboro sewing machine.

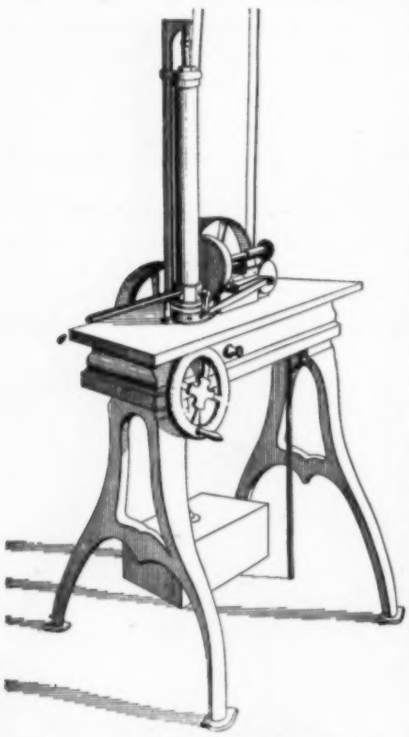


Fig. 127—The Ball machine for greasing bullets
(Drawing from the original machine at Springfield Armory)

Mr. White later went into partnership with W. L. Grout at Winchendon, Mass., and the writer was informed by the Lamson family, and by several of the old workmen at Windsor, that in 1861 E. G. Lamson sold out the Windsor sewing machine business to the firm of Grout & White, which shortly after removed it to Orange where it employed some thirty or forty men during the civil war.

In 1866, Thomas White moved the business to Cleve-

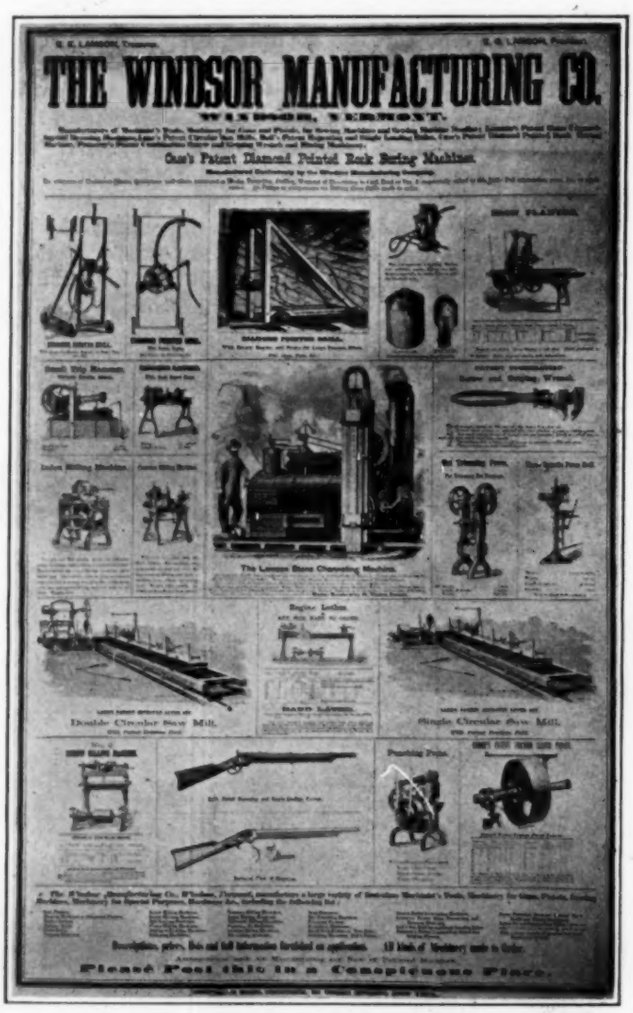

THE WINDSOR MANUFACTURING CO.
WINDSOR, VERMONT.
Gay's Patent Diamond Pointed Rock Boring Machines.
Double Circular Saw Mill.
Single Circular Saw Mill.

Fig. 128—The Lamson catalog of 1865
Courtesy the Jones & Lamson Machine Co.

Fig. 130—Original working force of the Jones & Lamson Machine Co., Windsor, Vt., 1876

land, where it became the White Manufacturing Co., the first in Cleveland to use accurate methods, and to produce interchangeable work. This company developed into the White Sewing Machine Co., and from this came the White Co., pioneer manufacturer of motor cars. These companies are two of the largest industries in Cleveland, and from the first was developed the Cleveland Automatic Machine Co., builder of the Cleveland automatic screw machine.

The Model 1861 Springfield rifles built by Lamson, Goodnow & Yale were muzzle loaders very much like the Enfield rifles of Robbins & Lawrence. While their manufacture at $18 to $20 each brought to the concern fully a million dollars, the progressive Mr. Lamson could not be content with such primitive arms at a time when there was so much agitation over the matter of breech loading and repeating rifles for the army.

Mr. Lamson heard of a precision bench lathe which had jut been designed by a young Worcester mechanic, Albert Ball. Being in need of such a machine for making sewing machine needles, Mr. Lamson went to Worcester and had Mr. Ball build several of the lathes for him on contract, in the shop of Lucius W. Pond, where Mr. Ball was a contractor building planers.

Fig. 132—Three Jones & Lamson veterans
Courtesy the Jones & Lamson Machine Co.

At this time the young Worcester mechanic showed Mr. Lamson a model of an ingenious magazine pistol upon which he was working in his spare time, and being convinced that Mr. Ball's repeating principle was good, he purchased the patent and influenced Mr. Ball to come to Windsor.

Much trouble was being experienced in the field, with the tallow-coated copper ammunition on account of its collecting dust and sand. The loaded shells were at that time dipped bodily in melted tallow. Mr. Ball went to work upon this problem, and within a few weeks he invented and built at Windsor, and had running at the Springfield armory, the Ball greasing machine shown in Fig. 127. This machine automatically filled with tallow only the grooves in the bullet that were covered by the cartridge shell, thus leaving the exterior of the ammunition clean and dry. This important improvement upon Mr. Lawrence's lubricated bullet was adopted at once, and the Ball greaser is now in use in all cartridge factories.

In 1864, Mr. Lamson bought out the interests of Goodnow & Yale at Windsor for the sum of $80,000. He then organized this business separately as E. G. Lamson & Co., a name shortly afterward changed to the Windsor Manufacturing Co., with himself as president

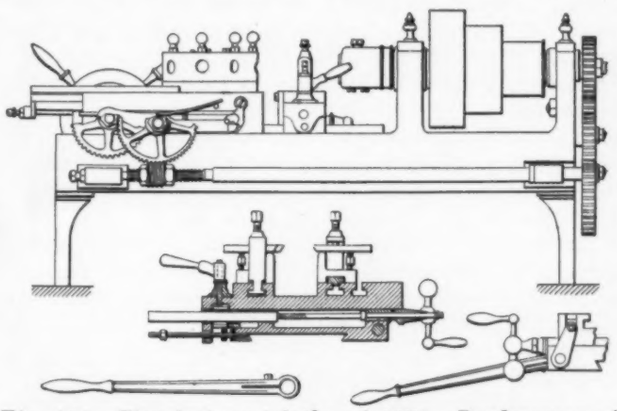


Fig. 131—Stone's turret lathe of 1874. Predecessor of the Hartness flat turret lathe

and his son as treasurer—Henry D. Stone and Albert Ball being retained as the mechanical experts.

Besides setting Mr. Stone and Mr. Ball to redesigning and improving the line of machinery inherited from Robbins & Lawrence, Mr. Lamson built new shops at Windsor for the manufacture of cutlery and scythe snaths, purchased much new real estate for housing and possible additions to his plant, and meanwhile looked eagerly about for other things to manufacture. That he was highly successful in spreading out over a large field is indicated by the first catalog of the Windsor Manufacturing Company, shown in Fig. 128, which was in the form of a 24-x38-in. poster. This poster is an extreme example of the diversified productions of a typical New England machine shop before the days of standardization.

The central figure of the poster—the Lamson stone channeling machine—was one of the most important, in that it practically ruined Mr. Lamson, crippled the Windsor industries for years, and led to the founding of the well known Sullivan Machinery Co. at Claremont, N. H. The story of this machine is as follows:

In 1866, E. G. Lamson happened to meet George R. Wardwell of Rutland, Vt., inventor of a steam channel-

ing machine for quarrying marble and other soft rocks.

As Mr. Lamson was not one who let an opportunity slip by, he immediately described the advantages of his machine works in such glowing terms that Mr. Wardwell decided to arrange with the Windsor Manufacturing Co. for the production of his machines.

The preliminaries had all been arranged between Mr. Wardwell and Mr. Lamson for the building of the Wardwell channeling machines at the Windsor Manufacturing Co., and the two men were in New York to complete the contracts with the Steam Stone Cutter Co., which had previously been organized there to finance Mr. Wardwell's patents and experiments, when—almost at the last moment—Mr. Wardwell met a friend on the street who influenced him to desert Mr. Lamson in favor of organizing to do his own manufacturing. Mr. Lamson was naturally highly indignant, and being a man determined to carry out anything he undertook, he returned to Windsor and set Albert Ball to work upon the design of an improved channeler of his own. Mr. Ball promptly brought out a machine of greatly improved design upon which several patents were obtained.

Col. Redfield Proctor (son of Jabez Proctor who was one of the founders of the Windsor industries) who later built up the Rutland Marble Co. into the widely known Vermont Marble Co., tried out the Lamson channeler very thoroughly in his quarry at Sutherland Falls, and his hearty recommendation of it encouraged Mr. Lamson to go ahead. Mr. Lamson then put through an initial lot of forty machines, when he was served with an injunction against the further sale of the Lamson channeler, pending the outcome of a suit for patent infringements, instituted by George R. Wardwell and the Steam Stone Cutter Co. of Rutland.

After a tedious legal battle, lasting nearly six years, certain of the patents of Mr. Wardwell were declared to be of a basic nature, and the injunction upon Mr. Lamson's machine was made permanent. He was ordered to pay damages to Mr. Wardwell to cover his infringement, so another long-drawn-out chancery suit was instituted by Mr. Wardwell to determine and recover these damages. Before the matter was fought to a finish, it not only cost E. G. Lamson his health of body and peace of mind, and a fortune of at least $300,000, but it also lost to the town of Windsor and to the State of Vermont, the valuable stone machine business, by driving away from Windsor the talented Albert Ball and his associate Roger Love, who in 1868, with Phineas Upham, organized at Claremont, N. H., the Sullivan Machinery Co. which developed into what is now the largest mining and quarrying machine industry in the world.

Other Lines of Manufacture

When Mr. Lamson saw that his channeling machine business was doomed to disaster, he cast about to find something else to install in his idle armory, and in doing so, turned to an old friend, Russell L. Jones, see Fig. 129, a cotton manufacturer of Colerain, Mass. Mr. Jones, whose dam had just been swept away by the flood of 1869, proposed that the Windsor armory be stripped of its machine tools and gun machinery, and that it be re-equipped with his machinery as a cotton mill. His suggestion was that the gun business be dropped entirely, but that the more or less profitable machine-tool business should be concentrated in the shops upon the north side of Mill Brook.

This plan appealed to Mr. Lamson, so he sold off all his gun equipment, mostly to the Winchester Repeating Arms Co. and to Smith & Wesson; and with Russell Jones and Col. Hiram Harlow, a Windsor capitalist, he reorganized the Windsor Manufacturing Co. as Jones, Lamson & Co. in 1869.

It was discovered that the machine business did not mix very well with the cotton business, so, in 1876, this branch was separately incorporated as the Jones & Lamson Machine Co. with Lieut. Ralph Lamson as president; Eastburne E. Lamson, secretary; Charles Jewett Jones, treasurer; and the veteran Henry D. Stone, superintendent. See group Fig. 130. About forty men were employed at times, and while the full line of machine tools was continued, the greatest attention was concentrated upon the manufacture of turret lathes having self-revolving heads, and a power feed mechanism for the turret slide, shown in Fig. 131, which was patented Oct. 20, 1874, by Henry D. Stone.

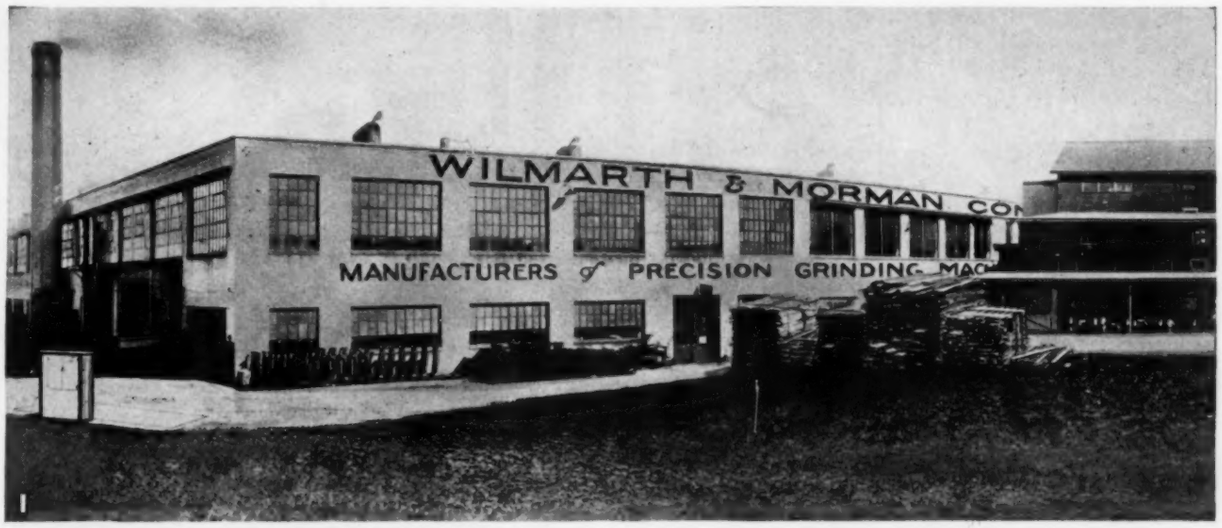
Failure Cripples Machine Business

Things went well for these two industries until July, 1883, when careless management, combined with increasing competition and other complications, caused the cotton business to fail. Floyd Brothers of Boston, who had financed Jones, Lamson & Co. up to the amount of fully $100,000, then stepped in and ran the Ascutney Mill until 1886.

The failure of the cotton business seriously crippled the allied Jones & Lamson Machine Co. but by leasing the plant from the Floyd Brothers it managed to maintain a rather precarious existence. Seeing that something drastic had to be done to save this machine industry from following the Jones & Lamson cotton business into oblivion, the directors decided to put it up for sale as a going concern, and thus bring new capital into it. Unfortunately, there was at that time in Windsor no one with the means, or at least with the courage, to purchase the controlling interest. Several manufacturers and business men of the neighboring village of Springfield stepped in, closed the deal, and the Windsor industry came under their control. Then, much to the disappointment of the public spirited citizens of Windsor, and the old time workmen in particular, it was decided to abandon the Windsor shops and to move the industry to Springfield.

Adna Brown, who was the originator of this movement, succeeded in interesting some of his friends in his plan for transplanting the industry. The transfer of stock was made in the spring of 1888, and at that time William D. Woolson, a clerk in the Springfield bank was elected assistant treasurer of the Jones & Lamson Machine Co. This new officer, together with Myron Whitcomb, the present head of the pattern department, and Mr. Johnson, the present superintendent, see group Fig. 132, were immediately sent to Windsor to become acquainted with the business and to superintend the removal. About this time Charles Jewett Jones, the treasurer, suffered a nervous breakdown as a result of his personal losses in the cotton business, and shortly afterward was found dead in Central Park in New York City. W. D. Woolson then succeeded him as treasurer and holds that position to this day.

In the fall of 1888 the transplanted Jones & Lamson Machine Co. was fully installed in this new plant, where on April 1, 1889, it began, under the direction of James Hartness, a new era of mechanical development which has since made this decidedly rural village a famous center in the machine tool industry.



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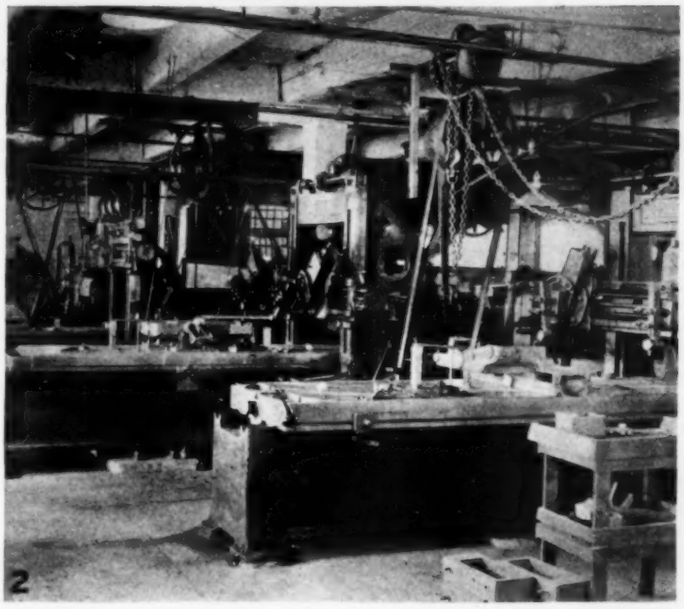


2

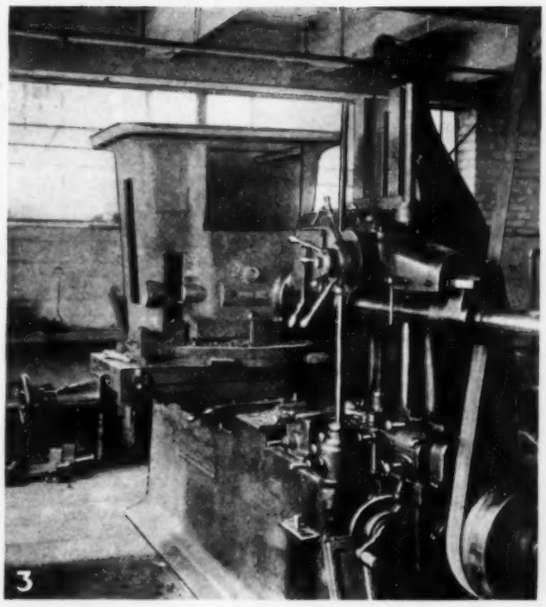
Where Machine Tools Are Made

Wilmarth & Morman Co.

Grand Rapids, Mich.

Established 1900

Fig. 1—General view of plant
Fig. 2—In the planer department
Fig. 3—Boring and milling base
Fig. 4—Assembling department



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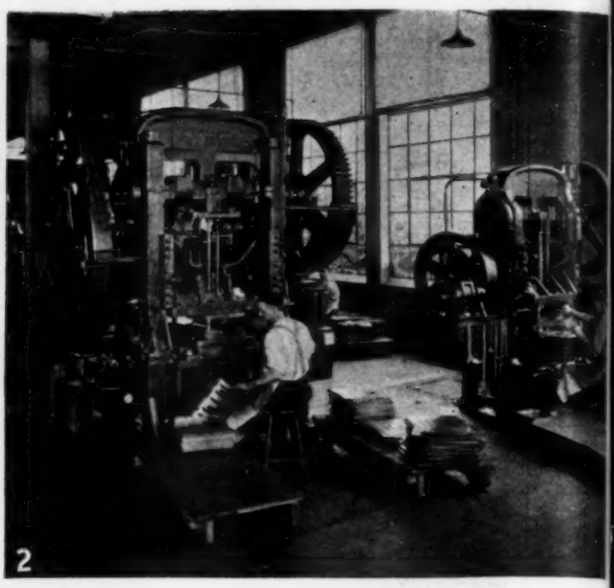


Operations on Sales

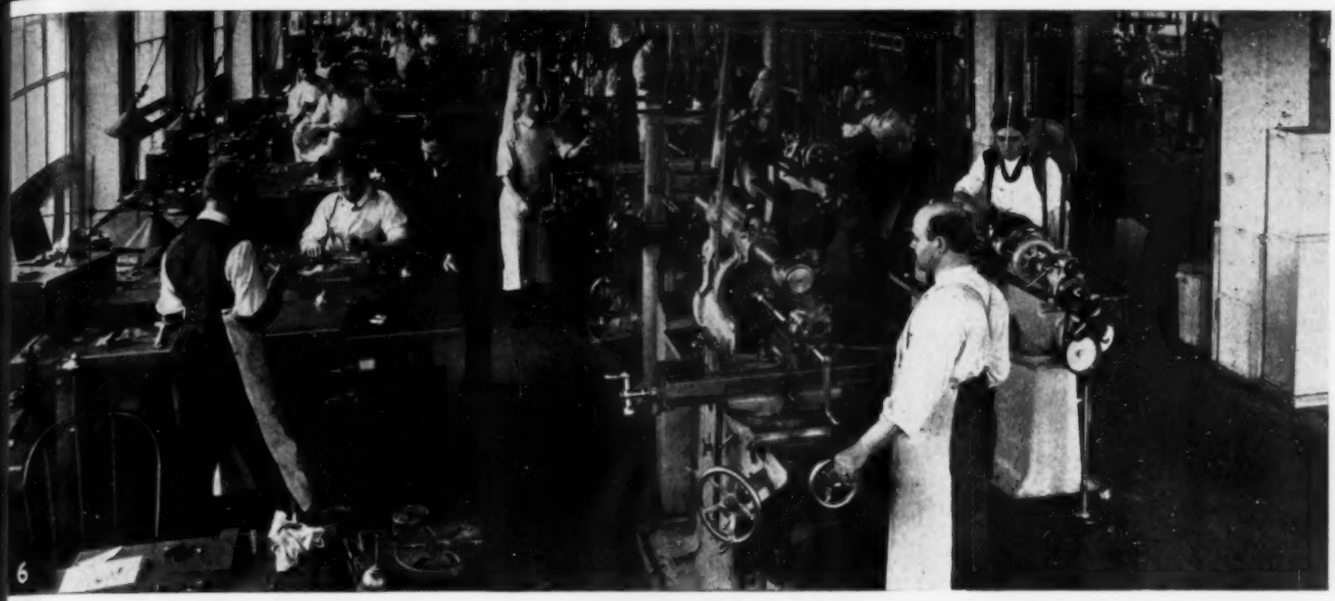
Fig. 1—Milling machine department

Fig. 2—Making the fronts

Fig. 3—Where 412 automatics hold forth

Fig. 4—A drilling department. Note chairs and foot rests

Photographs by courtesy of



Recording Machines

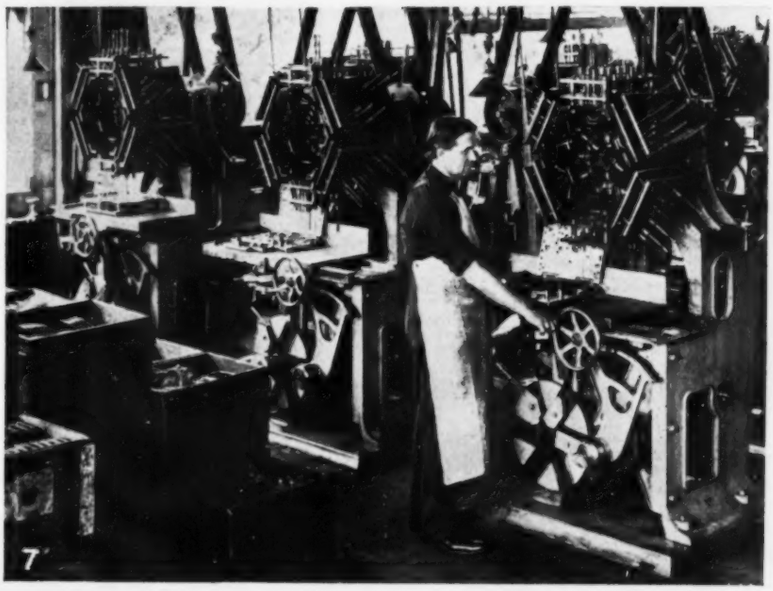
Fig. 5—Making steel look like quartered oak

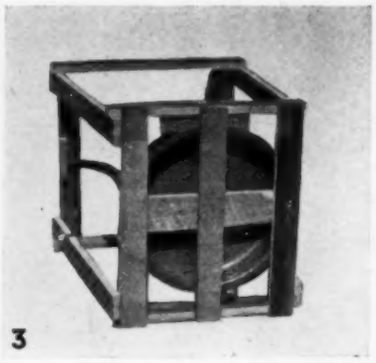
Fig. 6—Where the tools are made

Fig. 7—A few special drilling machines

Fig. 8—One of the assembly rooms

National Cash Register Company





Old and New Methods of Crating

How space and freight charges are saved and products better protected

Photographs by courtesy of Buffalo Forge Company

Fig. 1—Old crate for Bufco forge

Fig. 2—Side view of new crate with lock corners

Fig. 3—Top view of same crate

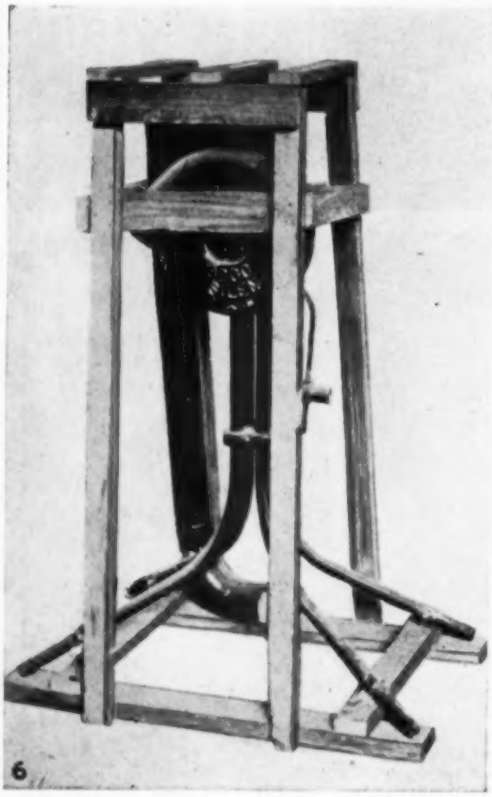
Fig. 4—Old crate for No. 240-H forge

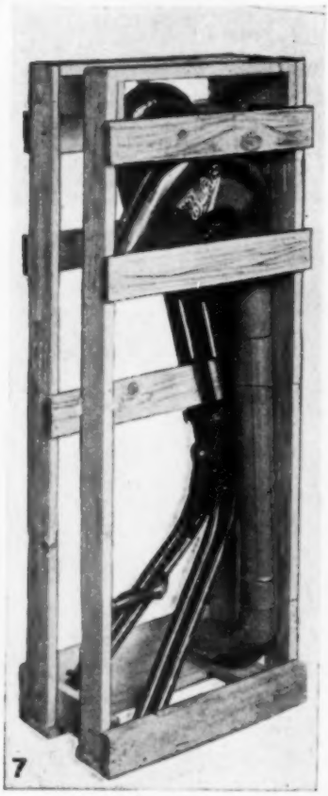
Fig. 5—New crate for same forge

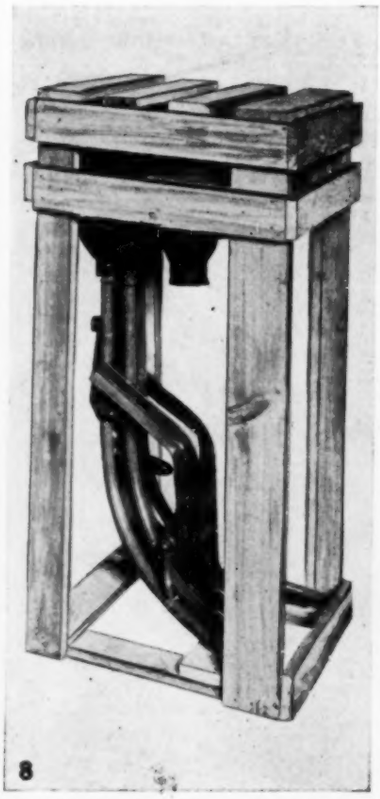
Fig. 6—Old crate for hand blower. Note spread of legs

Fig. 7—New crate for same blower

Fig. 8—Similar new crate for another forge







Manufacturing Silent Chain Parts

By C. J. Priebe

The Part That Press Work Plays

Fourth article—Stamping out links and washers—Hardening the chain parts—Annealing the ends of seat pins by electricity

THE treatment of the steel used in making the links and washers for silent chain at the plant of the Morse Chain Co. in Ithaca, N. Y., has already been discussed. The next operation is to stamp out the parts, so the coils of stock are brought over to the press room in the main plant. The width of the stock used is proportioned so that two links can be stamped out in the positions shown by the punched holes in

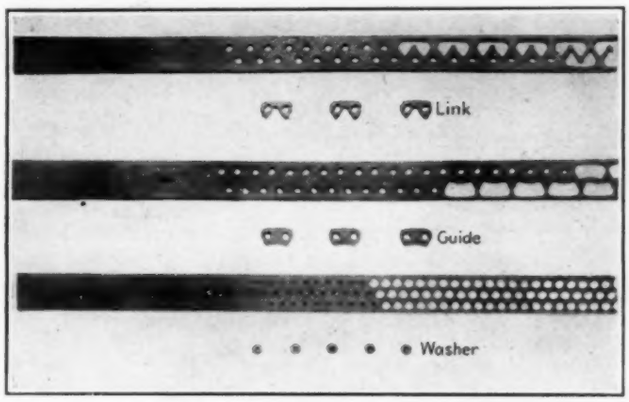


Fig. 23—How the links are stamped from the strip

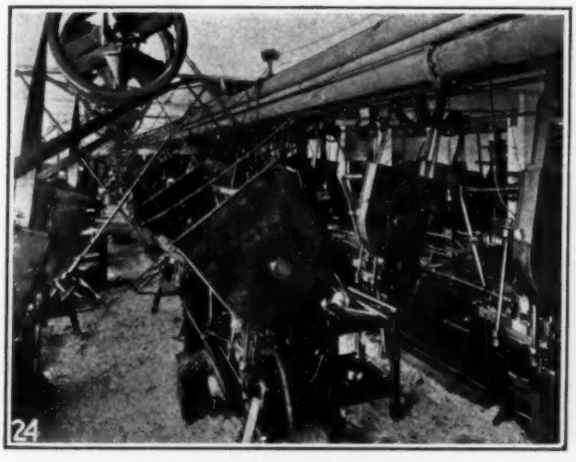
Fig. 23. The teeth of the links mesh together somewhat, and considerable saving is effected in the width of stock necessary. Although there is a fair amount of metal in the scrap that is left, it must be remembered that this waste is necessary because the punching cut cannot be taken too close to the edge of the stock.

Upon coming into the press room, a view of which is shown in Fig. 24, the first impression is of the remarkable amount of machine activity. A large number of presses are required; for ½-in. pitch alone there are sixteen batteries of machines stamping out links. Each of these batteries consists of four presses as shown in Fig. 25.

To see one of these batteries of presses in operation is most interesting. The presses shown were originally No. 2 V. & O., but they have been rebuilt to suit the requirements of the work and to make them automatic. The four are driven by belt from the same overhead lineshaft.

From a reel the side plate of which can be seen at *A*, the coil of stock is automatically unrolled and fed into the first press *B*, which punches the holes into which the pins will later go. Four punches are carried, so that four holes are made at a time, and the two holes that go in each link are punched at the same stroke. In this way the proper center distance between the holes in a link is always assured. The stock then feeds automatically, makes a loop and enters the second press *C*. In the second press the holes are drifted and burnished by tapered punches which remove no stock, but which make the holes exact as to size and shape. This is very important in chain manufacture.

The stock with the holes for the pins now completely punched passes down through the tube *D* and underneath the presses *E* and *F*. It then feeds back again and into the press *E*. This press is arranged to punch one link from one side of the strip, as shown by the chart in Fig. 23. It should be noted that this punching



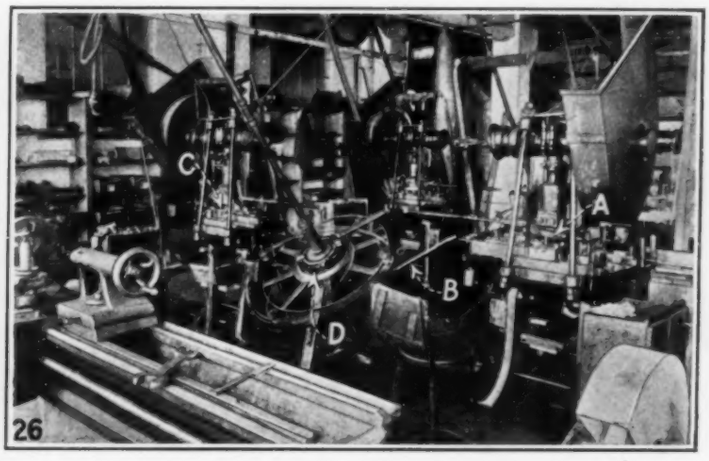


Fig. 24—View in press room where links are stamped. *Fig. 26—Battery of washer presses*

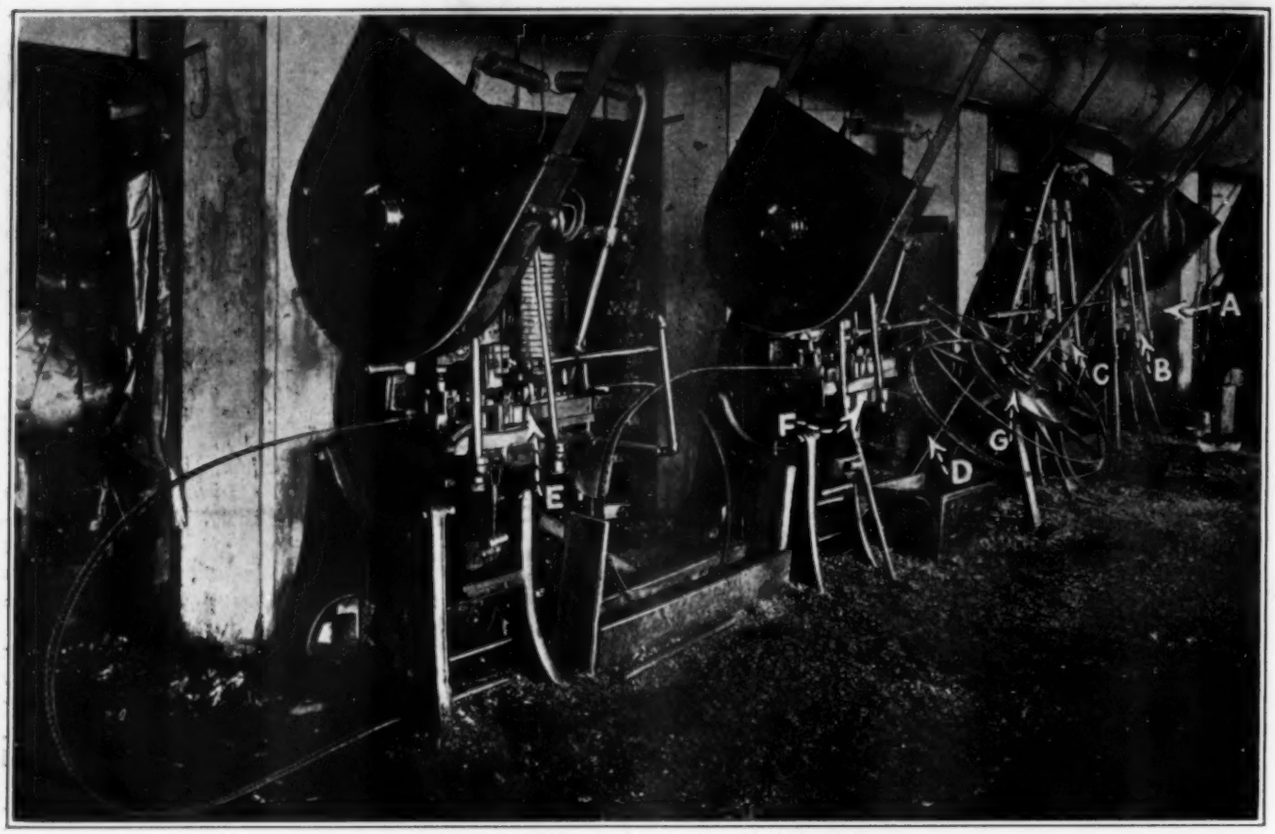


Fig. 25—Battery of four link presses

is done with the side of the stock upward that was down when the holes were punched, the effect being to keep the links flatter than if all the punching were done from the same side. Perfect register of the blanking cut with the holes is obtained by means of pilot pins attached to the bottom of the blanking punch and entering the pin holes in the stock.

After being fed automatically from this press, the stock makes another loop and goes into the fourth machine *F*, where the link is stamped from the other side of the strip. The scrap stock is then wound on the scrap reel *G*, which is power driven and automatic in operation. The entire operation is performed with rapidity and accuracy, although but a minimum of care is required by the operator after the group has once been started.

The loop between the presses gives flexibility and the handling of scrap stock keeps the department clear.

The guide links which are used to hold the chain in its proper position on the sprocket wheel are punched out in a similar manner, the layout also being shown in Fig. 23. The method employed when punching links of over 0.9-in. pitch is similar in the main, although the battery consists of only three presses because the drifting operation is not performed. Heavy stock such as used for links of 2 and 3 in. pitch is

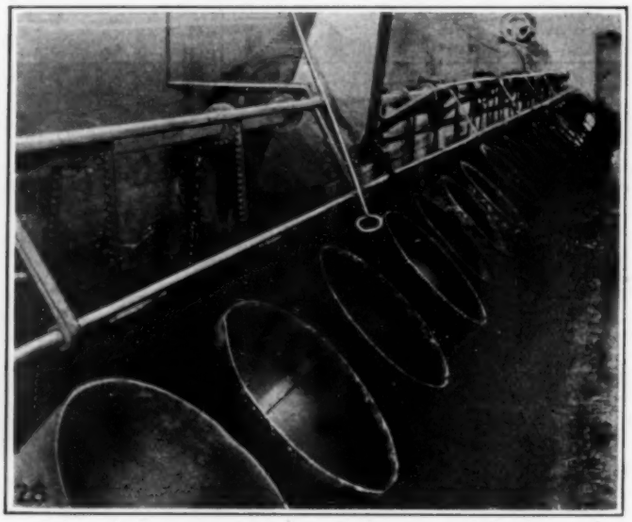


Fig. 27—View in one side of cyanide room. Fig. 28—Tumblers for chain parts

not coiled after rolling, so it is run through each press individually in lengths of about 18 ft. when stamping the links.

Presses equipped with similar feed arrangements are employed for stamping out the washers. A battery of presses for this work consists of two machines, one for punching the holes and the other for punching the washers themselves. In the press *A* shown in Fig. 26 there are three punches for the holes placed diagonally, since three washers are cut from the width of each piece of stock, as the operation chart in Fig. 23 shows.

The stock is then guided down through the tube *B* and passed in the reverse direction through press *C*, where the washers themselves are stamped out from the side opposite to that from which the holes were punched. Three punches are carried in this press also, so that three washers are dropped at each stroke. The stock is then brought to the automatic scrap reel shown at *D*. This reel is similar to others employed around the plant and is rather unusual in many respects; its purpose is to tightly coil the scrap and to keep it from twisting around among the machines. It is driven by power from overhead, and tends to continuously pull and coil the scrap. However, because the force must be transmitted by means of friction on the wheel *D*, a very great pull

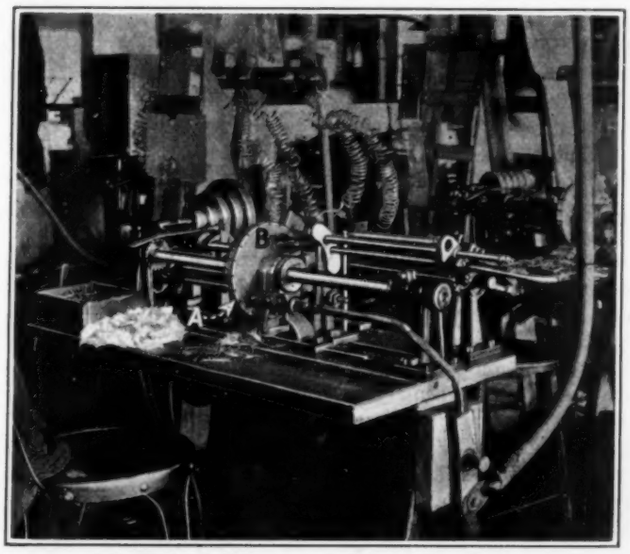


Fig. 29—Resistance-type annealing machine for small seat pins

cannot be exerted, and the feed of the stock through the press is not interfered with.

Just at this point it might be well to give a thought to the extensive press equipment that must be employed, as there are 168 punch presses in the plant. Machines can ordinarily be adapted to one size of work and kept on it. However, to take care of variations in the demand, it is possible merely by changing the punches and dies to convert a battery of presses for punching a different size of link. To keep the presses in order, and also to keep them properly supplied with sharp punches and dies, requires the services of a number of machinists and diemakers. Thus, it is the press room that is chiefly responsible for the large staff of toolmakers and the size of the toolroom.

The links and the washers are brought to the cyanide room for hardening, and are there treated in practically the same manner as the pins. After polishing in the

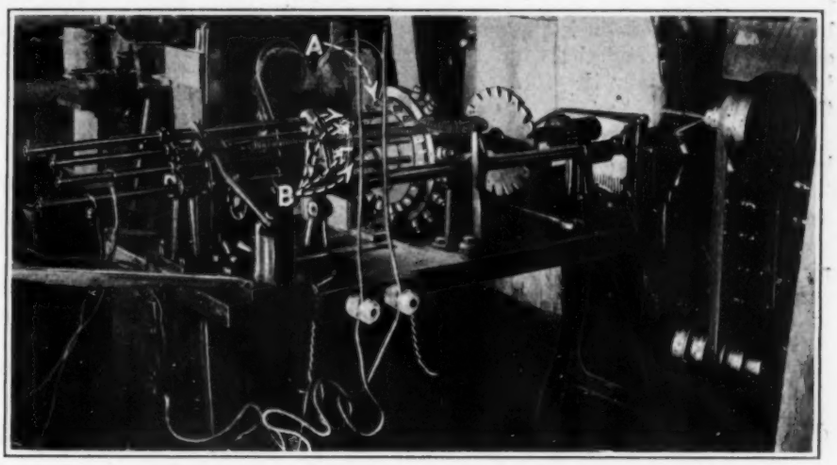


Fig. 30—Pin annealing machine of electric arc type

tumblers they are ready for assembly. No other machining operations are given to the bearing surfaces of the teeth.

Taking up the subject of hardening the chain parts we come to the cyanide room. The interior with some of the cyanide baths in view is shown in Fig. 27. There are ten of these furnaces, and it is here that the pins, links and washers receive their heat treatment. The furnaces are heated by gas from the gas producer plant. Each furnace is equipped with electric signal lights to indicate the temperature at which it is running and to aid in its easy control.

Details of Cyanide Bath

Pans full of the parts are brought to the room and placed close to the furnaces. The operator fills a wire basket with the parts and dips them into the molten cyanide bath held at the proper temperature. After the work has been heated sufficiently in this first or preheating bath it is transferred to the second bath, the temperature of which is held within a range of 5 deg. The parts are next dumped into a quenching bath of water on the side of each furnace.

Since the pins have previously been carbonized, the cyanide treatment gives a clean, hard skin and leaves the inside of the pin soft and tough. The links and washers, being of medium-carbon steel, harden entirely through and take a smooth finish on account of the cyanide. The parts are then drawn in an oil bath to remove any brittleness. They are now ready for cleaning or polishing, an operation which is done in a battery of about twenty-five tumbling barrels located along the rear wall of the cyanide room.

This battery, Fig. 28, consists of homemade drums set permanently at an angle and revolving 24 hours a day. They can be easily loaded and unloaded by the use of a shovel. Rotation is quite rapid, and the parts are rolled over and rubbed against each other with sufficient force to remove the fins, which drift to the

side of the drum and to the floor. Holes of different size are provided in the various drums, as suited to different sizes of work.

Before leaving the cyanide room, more attention should be given to its design. In the older plant some difficulty and discomfort was experienced because of the fact that the fumes and gas frequently became oppressive. When the plant was rebuilt a position was chosen for the cyanide room that would aid ventilation. The building is located on high ground at the rear of the other buildings, and the wind that ordinarily prevails is such as to carry the fumes away from the rest of the plant.

The row of furnaces that can be seen in Fig. 27 is backed up by another row of them, and over them all is a shaft or ventilator. The fumes are attracted up this ventilator so that at no time do they become oppressive in the lower part of the building where the men must work.

The rocker pins are now ready for assembly in the chain, but the seat pins require another operation. It has been previously noted that the seat pin carries the washers and must be riveted on the ends. This riveting requires a soft end, and is the reason for the difference in treatment between the rocker and the seat pin that occurs from this point on. The hardening process has just hardened the ends, so that riveting or peening would be difficult. Consequently an annealing operation by means of electricity is next performed. It should be noted that the very act of shouldering and cutting has removed some of the carbonized surface of the pin and reduced the hardening effect.

Annealing Small Pins

The small pins are annealed in a special machine operating on the resistance principle and shown in Fig. 29. The operator feeds the work-holding wheel *A*, putting a pin in each slot. This wheel indexes two slots at a time so as to bring two pins between the electrodes *B* at each end of them. These electrodes move in and out automatically and make electrical contact with the pins. In doing so they cause the current to pass through the pins and rapidly heat the ends of them. The circuit is then broken and indexing occurs. Slow cooling in air permits an annealing action which affects only the very ends of the pins and not the hardness of the wearing or central portion. There are sixteen of these machines, each turning out about 40 pins per minute. They operate on alternating current stepped down to 3 or 4 volts, which voltage is regulated by means of choke coils. The indexing operations are performed by power.

The large pins are annealed in an arc type of machine, due to the greater amount of metal which must be heated. This machine is shown in Fig. 30. Again the pins are fed by hand into the work holder at *A* and the rest of the operation is automatic. It will be noted that the arcs occur after the pins have passed over to the back side of the machine, which is the side shown, and that four arcs can be maintained simultaneously by the carbon electrodes *B*. The electrodes contact with the work and then withdraw to form the arc, which is later broken by the indexing of the work.

Since this machine anneals only one end of the pin at a time, each pin must be passed through twice. However, most of the machines are arranged for arcs at both ends of a pin. Direct current of 110 volts is employed, with lamp-bank resistance to control it.

Foreign Trade of United States in 1923

By Julius Klein
Director, Bureau of Foreign and Domestic Commerce

Distinct tendencies toward readjustment in those phases of American foreign trade that are most out of line with what may be considered normal and a gradual, but no less definite improvement in other directions, characterized our foreign trade during 1923. A decline from the abnormally high levels reached by our exports of foodstuffs on account of reduced European producing capacity was to have been expected along with Europe's recovery; and Europe's demands for industrial raw materials, which have been greatly reduced, should show an increase. Both of these tendencies are seen in our 1923 export trade. The continued, though moderate, growth in our exports of manufactured goods is encouraging, and we should be able to maintain and expand it even in the face of increasing European competition if we but make the most of our advantages in production and of the competitive advantages we have enjoyed on account of disruption in Europe during and following the war.

Our Foreign Trade

A very detailed study of the "Foreign Trade of the United States in the Calendar Year 1923" has been issued by the Bureau of Foreign and Domestic Commerce as Trade Information Bulletin No. 225.

Total merchandise exports from the United States in 1923 were valued at $4,168,000,000 and total imports at $3,792,000,000, an excess of exports of $376,000,000. Compared with 1922 this is a comparatively small increase of $336,000,000 (8.8 per cent) in the value of exports, a somewhat larger gain of $679,000,000 (21.8 per cent) in the value of imports, and a drop in the excess of exports over imports from $719,000,000 to $376,000,000.

Increases in imports were largely noncompetitive in character and seemingly well adjusted, in type, time, and volume, to our industrial needs. The closer balance between exports and imports is an unquestionably healthy condition. We have reached a position where we no longer have to make large payments through exports on account of interest on foreign investments here and foreign services rendered us.

Compared with the foreign trade of our principal European competitors, our trade in 1923 fared very favorably, exceeding pre-war values in both exports and imports by a larger percentage than the trade of any important European country. The gain in our 1923 export trade over that of 1922, however, has been considerably smaller than the growth in the export trade of the United Kingdom and of Sweden, and somewhat smaller than that of several other European countries, but European trade in 1922, it must be remembered, was in less favorable position. The movement during 1923 effects only a cutting down rather than a wiping out of our lead. Nevertheless, it does indicate a very definite "comeback" on the part of Europe, and presages keener future competition. We must be increasingly on the alert if we are to maintain our present position. In the import field our great prosperity and purchasing power is reflected in the substantially larger import gains, compared with both 1922 and pre-war years, than those of any European country.

From *Commerce Reports.*

How to Estimate Machine Shop Costs

By Albert A. Dowd

The time study estimate—Formula for cutting time and its application—Cutting speed tables—Complete time study estimate as made for a simple job

IN FIGURING the length of time necessary for a certain cut at a pre-determined speed and feed, the time can be obtained very easily by dividing the length of the cut in inches by the product of the feed in thousandths and the r.p.m. The result obtained is

TABLE OF CUTTING SPEEDS

R.P.M. REQUIRED FOR VARIOUS DIAMETERS TO PRODUCE A GIVEN CUTTING SPEED

DIAM.	30	35	40	45	50	55	60	65	70
1	115	134	153	172	191	210	229	258	267
2	57.3	66.9	76.4	86.0	95.5	105	115	124	134
3	38.2	44.6	51.0	57.3	63.7	69.9	76.4	82.6	89.1
4	28.7	33.4	38.2	43.0	47.8	52.6	57.3	62.1	66.9
5	22.9	26.7	30.6	34.4	38.2	42.0	45.9	49.7	53.5
6	19.1	22.3	25.5	28.7	31.8	35.0	38.2	41.3	44.6
7	16.4	19.1	21.8	24.6	27.3	30.0	32.7	35.5	38.2
8	14.3	16.7	19.1	21.1	23.9	26.3	28.7	31.0	33.4
9	12.9	15.0	17.2	19.3	21.5	23.6	25.0	27.5	30.0
10	11.0	13.4	15.3	17.2	19.1	21.0	23.0	24.9	26.8
11	10.5	12.2	14.0	15.7	17.5	19.2	21.0	22.8	24.5
12	9.5	11.2	12.8	14.3	16.0	17.5	19.1	20.7	22.3
13	8.8	10.3	11.8	13.0	14.7	16.2	17.6	19.2	20.7
14	8.2	9.5	10.9	12.3	13.6	15.0	16.4	17.8	19.0
15	7.6	8.9	10.2	11.5	12.7	14.1	15.3	16.6	17.8
16	7.2	8.4	9.5	10.7	12.0	13.2	14.3	15.5	16.8
17	6.7	7.8	9.0	10.0	11.2	12.3	13.5	14.6	15.6
18	6.3	7.4	8.5	9.5	10.6	11.8	12.7	13.8	14.8
19	6.0	7.0	8.0	9.0	10.0	11.2	12.0	13.1	14.0
20	5.7	6.7	7.6	8.6	9.6	10.5	11.5	12.5	13.4

For fractional diameters or others not given above, use the following formula.

C = Cutting speed in feet per minute
D = Diameter of work in inches
R = Revolutions per minute required

$$\frac{C}{D \times 0.262} = R$$

This formula is not quite correct, but sufficiently close for estimating

Fig. 17—Cutting speed table

the number of minutes required. Reducing the process to a formula we have

$$T = \frac{L}{F \times R}$$

in which

L = length of cut in inches;
F = feed in thousandths of an inch;
R = number of revolutions per minute;
T = time in minutes.

For example, when turning or boring a piece of work 4 in. in diameter, 2½ in. long, revolving at 50 r.p.m., and using a feed of 0.040 in. per rev., we should apply the formula as follows:

$$\frac{2.500}{0.040 \times 50} = \frac{2.500}{2.000} = 1.25 \text{ minutes}$$

This is the seventh article. The sixth article was concluded on page 885, Vol. 60, No. 24.

We have already shown the method of figuring the r.p.m. necessary to produce a given cutting speed, but for estimating work day after day, the use of a formula is tiresome and unnecessary, because the data can be incorporated in tables like that shown in Fig. 17. This particular table does not include fractional dimensions of any kind and it is therefore limited in its uses. It is quite convenient for rough-and-ready estimating purposes, but it is not comprehensive enough for close work, although fractional dimensions can be obtained readily by using the formula at the bottom of the sheet. For small automatic screw machine work a $\frac{1}{16}$-in. variation in diameter is important, but for larger work the amount of difference in speeds is not great enough to cause trouble in estimating. For automatic screw machine work it will usually be found convenient to use a table which starts at the ¼-in. diameter and proceeds by 32nds to 2 in., from which point the increment may be $\frac{1}{16}$ in. up to 4 inches. Above this point ¼-in. or ½-in. steps are sufficient. A table containing all these diameters and ranging from ¼ in. to 20 in. is cumbersome and troublesome in use if made on a single sheet, but a useful table can be made in loose leaf book form on smaller sheets. Sheets of this kind can be made on tracing cloth, blueprinted, and neatly bound in a flexible cover ring binder, along with other data of importance.

Useful Device for Finding Machine Speeds from Cutting Speeds

A device which the writer has used and found very satisfactory is shown in Fig. 18. This is a home-made affair consisting of a wooden base *A* on which two sidepieces are mounted at *B* and *C* to form the end supports for the various rolls *D*, *E*, *F*, *G* and *H*. The speed table used is laid out on tracing cloth about 7 in. wide, as shown in Fig. 19, and it takes in all important sizes from ¼-in. to 20-in. diameters. It is blueprinted on linen and the ends are glued together to form a continuous strip *K*. At the end of each roll a ¼-in. rubber band is placed around the roll so that the roll will drive the belt. Holes are drilled in each of the end pieces *B* and *C* and a screw and washer is placed at each end of each roll to keep it in position. The upper roll *D* has a knurled knob *L* at each side, used for bringing any desired combination of figures into position. An additional roll *M* is pivoted to an arm *N* and is kept in contact with the endless belt by means of a tension spring *O*, thus keeping the belt tight at all times. The body of the device is covered by a single sheet of aluminum *P*. A T-shaped slot is cut at *Q* and extends across the front of the plate, on the face

of which a small label *R* is glued just above the slot *S*. The various cutting speeds are clearly indicated on this label, the dividing lines of which coincide with those on the table underneath.

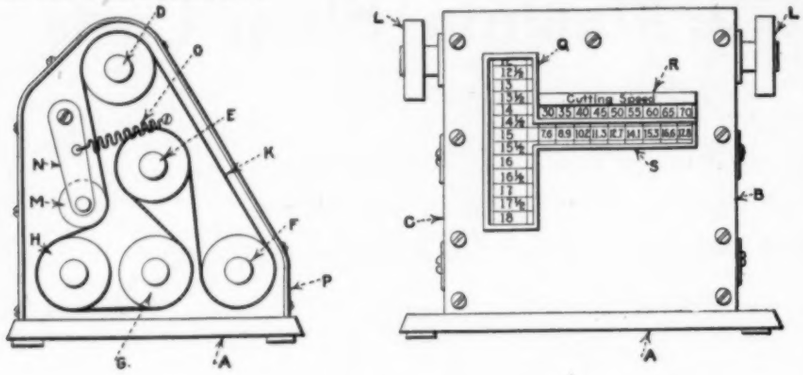


Fig. 18—Convenient device for finding machine speeds

The time-study man who wishes to find the correct r.p.m. required for a piece of work 15 in. in diameter, running at a cutting speed of 50 ft. per min., simply revolves the knurled knobs *L* until the number 15 appears opposite the long slot *S* as shown in the diagram. The opening at *Q* is made long so that the man using the device can see the numbers adjacent to the one he wishes. For general use this instrument is probably too costly, but a person can easily make one for his own use, as the writer did. One of the advantages of having such an instrument is that it is always at hand and in plain sight at all times. It can, of course, be arranged to show diameters in smaller fractions, if desired, and to cover a greater range of cutting speeds, but the design shown is sufficiently comprehensive for use in the usual run of ordinary estimating work.

Referring to Fig. 20, a complete drawing of the bearing case previously mentioned is shown and we are now to consider a time study for this part. In this drawing the various dimensions are given, together with the limits on important surfaces. The small-scale drawing sheet of this same piece, which has been used previously in making the free-hand layouts of jigs and tools, is now used again by the time-study man as a reference, in order to avoid specifying by name the various surfaces which are to be finished. The different portions which are to be finished are lettered *A*, *B*, *C*, *D*, etc., on the small drawing which is pasted to the time-study sheet, Fig. 21, as indicated at *X*. The time-study sheet itself carries at the top the necessary data regarding estimate number, customer's name and address, etc., and is printed and ruled with headings as shown.

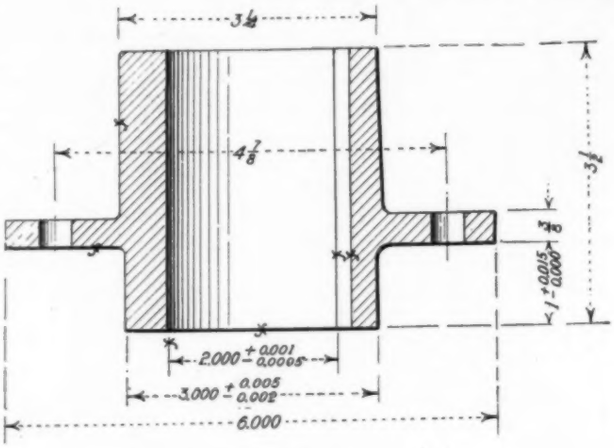
Taking up the first setting of the work, the time-study man refers to his operation sheet and the sketches of tools used; notes that the work is held in chuck jaws on a No. 4 W. & S. turret lathe; and that the first

TABLE OF CUTTING SPEEDS

R.P.M. REQUIRED FOR VARIOUS DIAMETERS TO PRODUCE A GIVEN CUTTING SPEED

DIAMETER	30	35	40	45	50	55	60	65	70
1/4	458	535	611	688	764	851	917	994	1,070
9/32	412	482	550	619	687	761	825	894	963
5/16	367	428	489	550	611	672	733	794	856
11/32	336	392	448	504	560	616	672	728	784
3/8	306	357	408	458	509	560	611	662	713
13/32	284	332	378	426	473	520	567	615	662
7/16	262	306	349	393	437	481	524	568	611
15/32	246	287	328	368	410	450	492	532	573
1/2	229	268	306	344	382	420	459	497	535
17/32	216	253	289	325	361	396	433	469	505
9/16	204	238	272	306	340	373	407	441	475
19/32	194	226	258	291	323	355	387	419	451
5/8	184	214	245	276	306	337	367	398	428
21/32	176	204	233	263	289	318	350	379	408
11/16	167	194	222	249	273	300	333	360	389
23/32	160	186	212	239	263	289	319	345	373
3/4	153	178	203	229	254	279	306	330	357
25/32	147	172	197	221	246	270	295	319	345
13/16	142	166	190	213	237	261	284	308	332
27/32	136	160	183	204	228	251	273	297	319
7/8	131	153	175	196	219	241	262	285	306
29/32	126	148	169	190	211	232	253	275	295
15/16	122	142	163	183	204	224	244	265	285
31/32	119	138	158	177	197	216	237	256	276
1	115	134	153	172	191	210	229	248	267
1 1/32	111	130	148	167	185	203	222	240	259
1 1/16	108	126	144	162	179	197	215	233	251

Fig. 19—Portion of continuous table used with device illustrated in Fig. 18



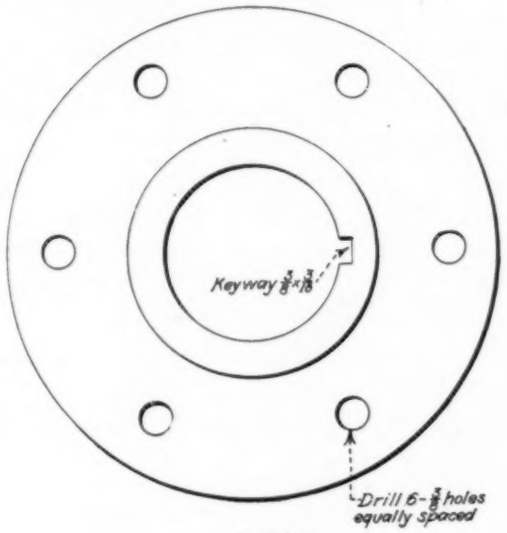


Fig. 20—Detail drawing of bearing case for time study estimate

EST. NO. 1764 TIME STUDY SHEET NO. 1

CUTOMER Phenix Mfg. Co. PART NO. B-650

ADDRESS Bankville, Ohio NAME Bearing case

MATERIAL Malleable iron

SET NO.	OPERATION	SURFACE	MACH. USED	DIAM.	LENGTH	SPEEDS F.P.M.	SPEEDS NEAREST R.P.M.	FEEDS PER REV.	TIME IN DECIMAL MINUTES TURRET C.S. ETC.	EACH CUT	EXTRA ALLOW	TOTAL
1	R. bore	A	W. & L.	2	3½			.040	Turret	2.74		
	R. turn	B	#4 Tur. Ca.	3	1							2.74
	R. face	C		6	1½	50	32	.020	Cross slide	2.35	.08	
	R. face	D		3	½							
2	F. bore	A		2	3½	25	46	.040	Turret	.83		
	F. bore	B		3	1	70	90			.55		1.38
	F. face	C		6	1½	72	46	.040	Cross slide	.83		
	F. face	D		3	½							
3	Ream	A		2	3½	35	62	Hand	Turret	.30		.30
	Allow for setting up and removing work and for incidental time											.75
2	Drill	E	Cin. 16" Dr. mach.	⅜	⅛ + 3/16	60	610	.007	Head	.56	.08	.64
	Allow for placing and removing work from jig etc.											.60
3	Broach	F	La R. Bro. Mch.	⅜ width	3½	-	-	-	-	.17	.10	.27
	Allow for setting and removing work and incidental time								-			.33
	Total time for all operations											7.01

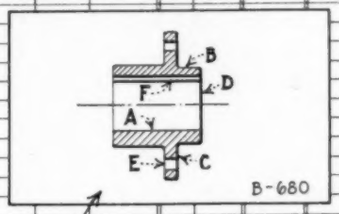


Fig. 21—Complete time estimate for bearing case

operation consists of rough-boring *A*, rough-turning *B*, and rough-facing *C* and *D*. The various diameters and length of cuts are obtained from the drawing of the part and entered in the proper columns. The turret carries the boring and turning tools while the cross-slide holds the facing tools and, since all these tools are working simultaneously, the cutting speeds must be proportioned for the largest diameter—6 inches.

Malleable iron can often be cut at 70 ft. per min., but in order to be conservative the time-study man figures it in this case at 50 ft. and finds, by reference to his machine data sheet, that the nearest speed on the machine is 32 r.p.m. He then selects a feed of 0.040 in. for the turret tools and 0.020 in. for the cross-slide, in order to equalize the cutting in the roughing operation. The boring of the hole takes slightly longer than the facing cut, but it would hardly pay to change the speed after the facing tools had finished their cutting. The total time necessary for the turret to complete this work is 2.74 minutes.

In the second operation the same arrangement of tools is used for finishing, but the speeds are considerably increased and the cross-slide tools are allowed to "dwell" while the speed for boring is increased for the remainder of the cut. The total time for this operation is 1.38 minutes. The final operation of this setting is reaming and the speed is decreased to 35 ft. per min. It is not usually advisable to ream work at the same speed used for other finishing operations, because the action of a reamer is somewhat different from that of other cutting tools. It will generally be found that a reduction of about 50 per cent should be made for finishing cuts when made with a reamer. Another matter which must also be considered when reaming is the method of feeding the reamer through the work. In most cases hand feeding will be found most economical, both on account of less wear on the reamer and also because there is a considerable saving in time. The allowance for reaming our work is 0.30 min. and this completes the actual cutting operation on the piece.

An allowance must now be made for setting up the work in the chuck jaws, and removing it therefrom after the machining operations have been finished. Allowances must also be made for incidental time, such as the indexing of the turret and the various movements of the cross-slide to bring it into position for the different cuts. It is best to allow a little too much time for setting up and removing the work than not to make a sufficient allowance to cover contingencies. The indexing of the turret is very rapid and yet, when very long boring bars are used, the turret slide must be run back a considerable distance by hand before indexing. In the case shown the total allowance for setting up and removing the work is about 0.60 min. and the extra allowance for indexing, etc., is 0.15 min., making a total of 0.75 minutes. In the next setting the six holes *E* are to be drilled with a multiple drill-head, the work being held in a jig on the table of the machine. Since all the drills are operating at the same time, we have to consider for the length of cut only the thickness of the work plus the length of the point of the drill. For estimating purposes the writer has always used one-half the drill diameter as the length of the point and, although this is not absolutely correct, it is sufficiently close for the time study. In our example the drill diameter is $\frac{3}{8}$ in. and the thickness of the flange is the same, so the amount of feed necessary is $\frac{3}{8} + \frac{3}{16} = \frac{9}{16}$ inch.

The speeds and feeds used for drilling in actual practice are scarcely safe to use when estimating and, although a cutting speed of 80 ft. per min. with a feed of 0.008 in. may be permissible for malleable iron, it is much better to be conservative and use a cutting speed of 60 ft. per min. with a feed of 0.007 in. per revolution. The nearest approach to 60 ft. cutting speed, that we can obtain on the machine through the gear ratio in the multiple drill-head, is a machine speed of 610 r.p.m., and using the specified feed the necessary time is found to be 0.56 min. An allowance of 0.08 min. is made for the approach and removal of the drill-head from the jig, making a total of 0.64 min. for the drilling time. The operator must also place the work in the jig, clamp it, and set it correctly under the drill-head and, after drilling, he must loosen the clamps and remove the work. The allowances made for these operations total 0.60 minutes.

The third setting is for a broaching operation by which the keyway is cut through the hub, as shown at *F*. In figuring the time for broaching any piece of work the time-study man must consider whether it is profitable to handle more than one piece of work at a time or not. In a great many cases two or more pieces can be held and broached at the same time with a corresponding increase of production. In the example we are considering that one piece only is broached at a time and the broach is pulled through the work in 0.17 min. An allowance of 0.10 min. is then made for the return of the screw, making a total of 0.27 min. The allowance for setting and removing the work and the incidental time for this operation totals 0.33 min., making a total of 0.60 min. for each piece. In adding up the various items of time consumed for the different operations, we have a total of 7.01 minutes and this may be considered as the time-study estimate for the work.

No allowance has been made on this time-study for setting up the machines for the job but this will be taken up in the summary estimate. It is of particular importance for the time-study man to understand from his own actual experience in the shop just what extra time must be allowed for setting up and removing the work; for indexing the turret; for moving the cross slide forward and back; for roughing and finishing cuts; for approaching a piece of work which is to be drilled; and for numerous other small items which take time, yet which are not included in the actual cutting time for the work. A non-practical man cannot put himself in the position of the operator who is doing the work, and therefore, his estimate of incidental time must be based on observation only. The man who has made a great many observation time studies will have undoubtedly obtained much practical information which will be found of value in preliminary time study work, but the practical man has his own actual knowledge to guide him in addition and he is therefore better fitted for the work than the other.

The Genesis of a Dual Personality—Discussion

By Proctor Brandon

I HAVE read with interest the articles by Harry Senior on page 458 and by D. Wright on page 649 of the *American Machinist*, in which the former would take to task certain business executives who are seemingly deficient in hospitality, to the extent of meeting a caller upon the doorstep, so-to-speak, instead of inviting him into the parlor, while the latter argues in defense of such action on the ground that one can never tell when one's hospitality is going to be abused.

I cannot escape the feeling, however, that the executive is more sinned against than sinning. The law of averages is in support of this feeling; there are so many more callers than executives. Especially during the last five years has the army of callers—salesmen, agents, canvassers, propagandists, charity-workers, or whatever may be the titles under which they present themselves—increased to such vast proportions that were the average executive to act the part of the genial host, he would cease to be an executive and would divide his activities between welcoming the newly arrived and speeding the parting guest.

For this reason, if for no other, the executive who would render conscientious service to his employers or his board of directors, is compelled to discriminate between those callers whose visits may result to the advantage of his company and those whose object is purely selfish. With the best intentions in the world, he cannot afford to risk a goodly portion of his time in catering to the convenience or gratification of men whom he has never seen before and may (possibly) hope never to see again. Until he is reasonably sure of the object of his would-be callers visit and that there is a fair prospect of its resulting to his or to mutual advantage, he must adopt such means as he may to hold the interference as nearly as possible to its minimum.

To bring about the desirable state of affairs wherein all the Mr. Seniors on the road may be received in the manner that this particular representative would appreciate, and in which every executive could be the pattern of geniality and good-fellowship that he would like to be, a good deal of education is needed, and in this education it is the executive rather than the salesman who must play the rôle of instructor. In order to protect himself against such an exhibition of ill-advised salesmanship as that of which Mr. Wright complains, he must train his own representatives against inflicting a like ordeal upon his brother executives. In suffering such an infliction himself, he must be able to make the offender understand, without offense, that his visit has been detrimental rather than constructive.

The day is rapidly approaching, indeed, in many of our larger business houses has already arrived, when a special representative must be appointed whose sole duty it is to deal with callers. This representative is not in any sense to replace or substitute for the man higher up, but rather to act as a buffer between him and unwarranted interference. And the job of being a buffer is by no means the easiest one about the place. Too long has it been entrusted to the young man or young woman whose intelligence is gaged by his or her ability to operate a telephone switchboard and who has been taught to say, through a hole in a glass window, "Who did you wish to see?" and to reply (if your appearance did not overawe) "He ain't in."

The reception manager (Mr. Senior will pardon me for adding to his list) must be of intellectual capacity equal to that of the man who guides the business. He must be able to talk intelligently about any branch or detail of the company's affairs that it is permissible to discuss with any possible caller, and he must be in sufficiently close touch with the heads of every department to be able to speak for them should occasion arise. He must, in addition, be a master of diplomacy and self-control.

Such a man will meet every caller, ascertain his business and if possible settle it on the spot or, if beyond his province, arrange an appointment for the department head with whom it must be transacted. His station will not be on the doorstep, nor even in an "inhospitable lobby." He will have an office equal in its appointments to any of which the company can boast, and in that office will receive any and every person who may consider it his or her duty or privilege to call. To every stranger who enters the outer door he will be "The Company."

Business Letters—How to Write Them

By Sherman Perry
Correspondence Adviser, American Rolling Mill Co.

Making a good beginning and a better ending—Some of the deadly stereotyped phrases in common use—Saying what you mean in the fewest words

DID YOU ever take a large collection of letters and analyze them to see how they measured up as to mechanical perfection, quality of thought, diction, and salesmanship?

This is the type of work I have been doing now going on five years. And a conclusion I have reached after reading thousands of business letters is that the average letters—and there are millions of them written every day—are a mighty poor specimen when measured by a definite yardstick.

Maybe you do not agree. Very well, investigate. Make a little inspection that will require not more than a day and perhaps only a few hours.

Collect, say, one or two hundred letters. Get a miscellaneous assortment; traffic, operating, purchasing, advertising, credit and collection, and sales. Get a fair honest-to-goodness collection so that any conclusions will be reliable.

> WHEN you write a business letter do you use such phrases as: advise, at an early date, at your earliest convenience, and oblige, awaiting your further orders, contents carefully noted, esteemed favor, permit me to say, thanking you in advance?
>
> Do you talk that way when you meet business acquaintances?
>
> Do you like to read such letters or do they have a depressing effect?
>
> After you have read Mr. Perry's article look over the carbon copies of some of your own letters and see what you think of them. They may surprise you.

First, let us agree on what we shall look for. In the first place, a letter, if it is a good one, is *speech* recorded on paper. It is clear, forceful, individualized speech, just the kind of speech used by every one who must get his ideas across so as to interest, convince, and persuade. It is the kind of speech used by every successful man in his contact with men. Effective speech is the vehicle that transports our ideas and plants them in the minds of others. Effective letter-writing is, therefore, effective speech or conversation.

Surely you must agree with that.

Then let us begin the inspection. We find those letters spattered from beginning to end with such expressions as: According to our records, advise, along these lines, and oblige, as per, proposition, assuring you of our prompt attention, at an early date, at all times, at this time, at hand, at the earliest possible moment, at your earliest convenience, attached find, attached hereto, awaiting your further orders, beg, by return mail, complaint, contents carefully noted, duly noted, enclosed herewith, enclosed you will find, enclosed please find, esteemed favor, even date, favor, for your information wish to advise, hand you, has come to hand, I have before me your letter, in due course, in reply wish to state that, kind order or favor, oblige, our records show, please be advised that, proposition and line, permit me to say, recent date, referring to the matter, regarding your communication of, referring to your favor, same (as pronoun), state (for say), thanking you in advance, the writer wishes to say, the above subject company, under the above subject, this is to inform you that, this letter is for the purpose of asking that, trust this will be satisfactory, under separate cover, up to this writing, you say, you state, we see by your letter, we take pleasure in sending you herewith, we wish to notify you that, we would advise, wish to say, would ask that, would say that, would state, your letter received, yours of recent date to hand.

We find many letters reading something like this: "We are in receipt of your valued inquiry of the 16 inst. which has just come to hand and same is receiving our prompt and careful attention.

"Beg to advise that your order will go forward not later than the 10 ult. Our records show all work progressing according to schedule.

"Assuring you of our desire to cooperate and trusting that we may continue to merit your valued orders which shall always receive our best attention, we beg to remain.

"P. S. Attached hereto is our latest price list. Our latest catalogue is forwarded under separate cover."

Does anybody talk like that? Imagine, if you can, a man standing before another man and saying "We are in receipt of your valued inquiry of the 16 inst." No, you can't. But there it is along with many other expressions equally lacking in all the requirements of good speech. Such phrases make letters commonplace. They are cant. The newspaper man calls them "bromides,"—"chestnuts,"—because they are lacking in originality. They are overworked, hackneyed. I heard a man once call such phrases symptoms of senility and that isn't far wrong.

From the requisite of good speech, then, we find our letters defective. They are indications of mental laziness or sluggishness. A good rule to lay down here is: *"Think first,"* a second, *"Don't write it, say it."*

The man that *dictates* a letter will say, "In com-

pliance with your request, we have proceeded to alter our records to embody the changes you desire"; but the man that uses good speech will *say:* "Your order is now changed to include only those sizes given in your letter of July 30."

Suppose we now see how our letters get away in the opening. How should they begin so as to be interesting and alive?

Every letter should *begin promptly.* It should give some *pertinent* information in the first few words, certainly in the first line. But no matter what kind of letter it is, it should begin with the reader's point of view. We do not write letters for ourselves; we write them for the reader. Therefore, we should get in step with him; try to see him and his problems. And unless we have this understanding we cannot write really effective letters.

How the Usual Letter Begins

How many letters begin after this fashion: "I have before me your valued inquiry which has just come to hand relative to the use of Armco-Ingot Iron for milk cans." There isn't a single item of pertinent information, nothing save the obvious "I have your letter."

Contrast that with this: "Milk cans made of Armco-Ingot Iron, about which you wrote us on February 1, will stand rough handling, resist rust, and give exceptionally long service that keeps down your replacement expense." Nothing clever about that. It merely gets down to brass tacks right from the start.

Often letters are burdened with two or three worthless paragraphs in the most emphatic position in the letter—the opening. A good way to get away from this bad habit is to practice the art of expression by compression. Make every word count.

The next chronic weakness of letters is the ending, which is, next to the opening, the most emphatic part of the letter. Thousands of letter-writers seem unable to tell when a letter is finished. Instead of telling the story in a direct and natural manner, they wind up with a weak, if not meaningless, wooden expression that is decidedly awkward and clumsy. They seem to think some special form of leave-taking is required; so they make their "bow" after this fashion:

Typical Ending of Business Letters

"Hoping to hear from you at an early date and assuring you of our earnest desire to serve you in any way possible, we beg to remain."

I wonder how folks who write like that would feel toward a speaker that used the same tactics in ending a speech, "Trusting you have enjoyed the occasion and assuring you of—." But, no, *good speech* doesn't tolerate any such anti-climatic end. Let the letter-writer "tell his story" and then quit.

Wordiness is another bad feature. It is a fault even among correspondents that do not use the old stereotyped way of saying things. The trouble is they will not force their minds to take the shortest route between two periods.

Here is a letter dictated in 67 words:

"The third item of this order calls for 300 sheets of 22 gage 20¼ x 61.

"Our reason for writing you is that the gage on this item is rather blurred on our copy and we want to be sure that it is filled properly.

"Will you kindly check over your copy of order and see that this item reads as above."

It could be written in 29 words without being blunt or curt:

"The third item of this order is blurred. We make it out to be 3,000 sheets of 22 gage 20¼ x 61. Is this correct?"

Is this worth while? The difference between 67 words and 29 words is 38 words. Using 67 words as the base, we get a saving of 57 per cent. But if we use 29 words, the number that might have been used, we get a saving of more than 100 per cent. Either way you want to figure, the saving is worth while when we think of the cost included in dictator's and stenographer's time, stationery, postage, and overhead. Some persons think the cost of a letter is a sheet of paper, an envelope, and a stamp.

Summary of Faults

Summing, up, we find these general faults: Hackneyed phrases, that show no mental quality, long-winded openings that tell nothing, unnatural endings that are so awkward they fall flat and make a bad impression. Although a detailed study of the technique of effective letter-writing involves endless study in the use of persuasion and conviction, the elimination of the obvious defects we have discussed will do wonders toward toning up letters and lifting them out of the common-place lot.

This can be done if one will keep constantly in mind a definite objective:

1. Make letters conform to good speech.
2. Tell your story promptly, without any unlimbering exercises.
3. Quit without any unnecessary flourishes.

Co-operative Meetings on the B. & O.

A general co-operative meeting of the motive power department of the Baltimore & Ohio Railroad held recently included representatives of the management and the general committee of the Federated Crafts. As the co-operative plan has now been extended to every important repair point on the system, such a meeting is of great significance as a step toward maintaining harmonious relations in the future. One feature of the plan is a recapitulation sheet that is given each man attending the meeting. This sheet gives an outline of the co-operative meetings at the various shops, shows the number of men present representing both management and employees at each meeting, the subjects discussed and the disposition made of them.

The chief of motive power, George H. Emerson, showed that of the budget for his department in 1923, 63.7 per cent went for wages and 36.3 per cent for material. He believed that material costs could be reduced and pointed out that every dollar saved on material made that much more money available for labor. He feels that a larger percentage of used material may well be utilized in making repairs and that greater efforts to prevent spoilage of new material will result in marked economies. The principal topic of discussion at the next meeting is to be material costs and such items as the better care of tools, the prompt reporting of defects and repairs needed in power will also be discussed. Meetings like this cannot fail to benefit all concerned and the spirit of co-operation promoted by such meetings is sure to be of value as time goes on. Differences of opinion are bound to arise, but amicable settlements are easy under such conditions.

Cutting Costs by the Use of Conveyors

By Fred H. Colvin
Editor, *American Machinist*

Some of the Maxwell methods of handling the chassis and body in their various stages—Devices that save money in many ways

IN ADDITION to introducing machining methods and special tools for making the various parts of the Maxwell car, at both a lower cost and improved quality, the factory management has paid careful attention to other sources of economy. Realizing that there are many opportunities for economies in the handling of parts, especially those of a heavy and bulky nature, a careful study was made of the available apparatus for use in connection with the assembly line, and the following illustrations show the results.

The continuous assembly method was adopted as a matter of course, the trucks carrying the frames crosswise of the track, with the chain in the center as usual. Fig. 1, shows the frame upside down on the first truck, the front and rear axle units, which include the springs, being assembled in this position. The second frame is being turned over in the special roll-over hoist shown, which practically eliminates all hand labor.

The roll-over hoist is suspended from a special framework that carries a horizontal air hoist *A*, the cables

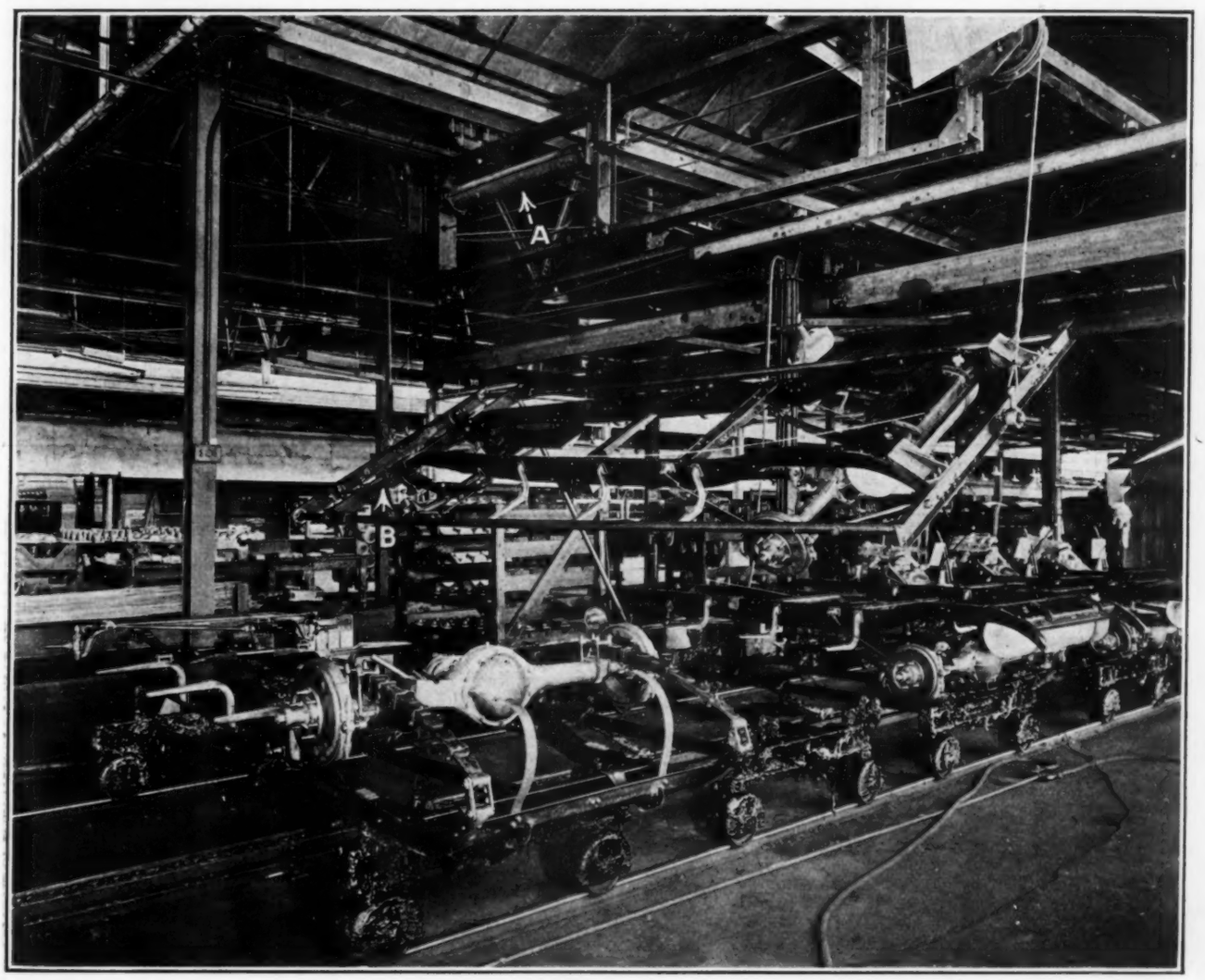
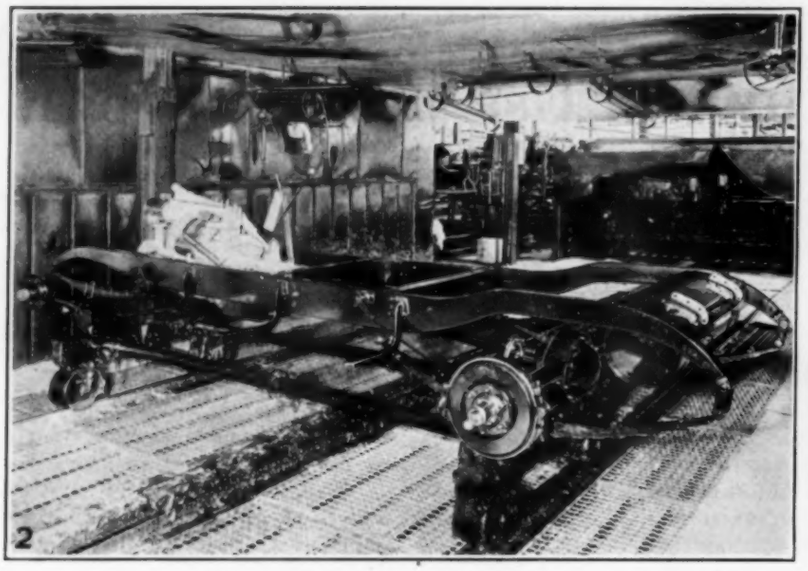


Fig. 1—Roll-over hoist for frames



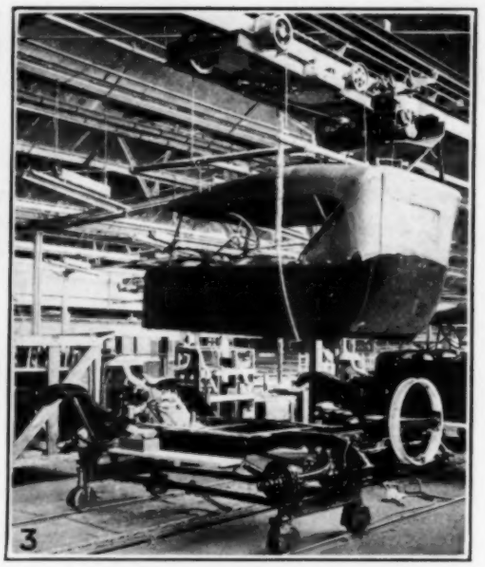


Fig. 2—Paint room with exhaust in floor. Fig. 3—Crane for handling bodies

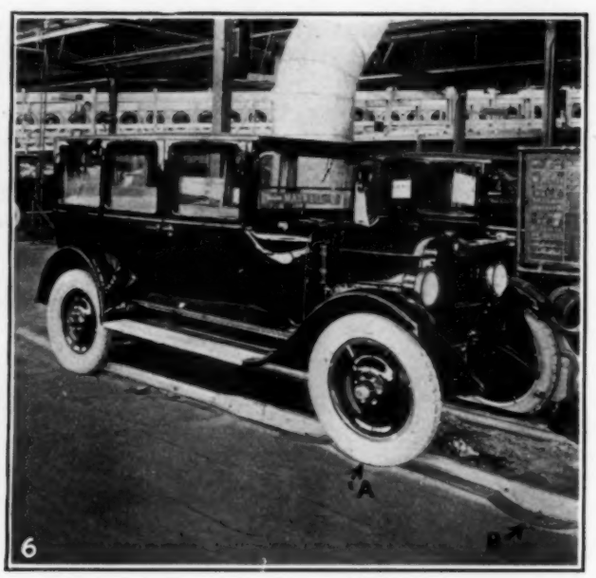


Fig. 4—End of the assembly line. Fig. 6—Running test for complete car

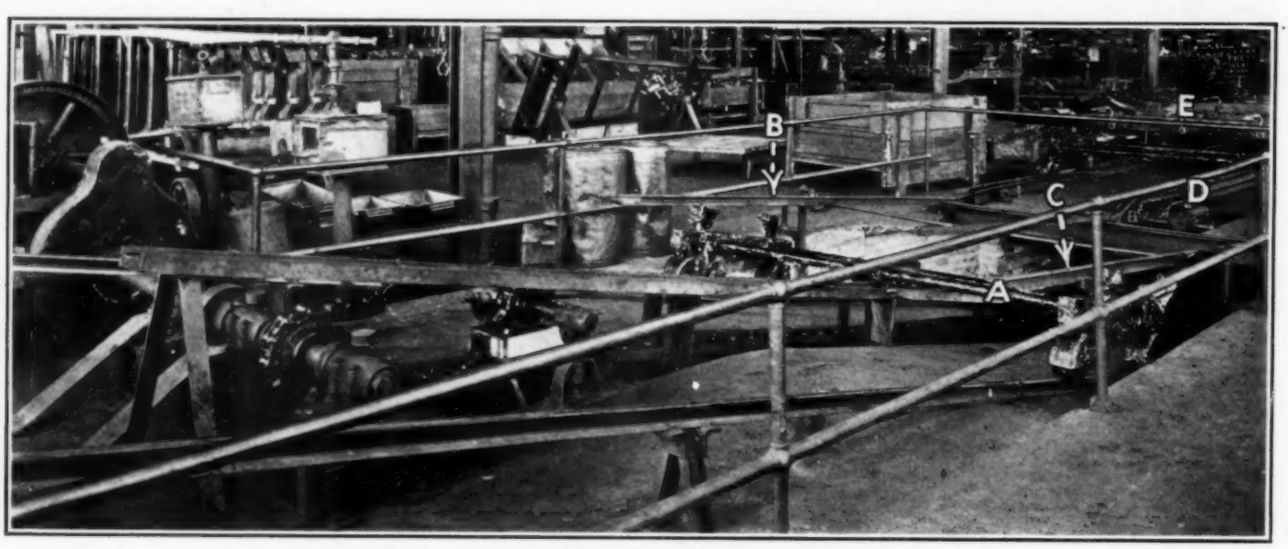


Fig. 5—Return of frame-assembly truck

running over large sheaves at the end. The motor frame is held by the ends in the brackets or pockets shown. The brackets at the left are on the crossbeam *B*, which is quickly operated by toggle, enabling the motor frame to be quickly gripped in the roll-over frame, and easily hoisted, rolled over, and lowered on the truck in its normal position. The trucks then travel through the spray shed and into the drying oven. Fig. 2 shows how and where the painting is done. The interesting feature is, that at this point the floor has liberal openings through which the paint fumes are drawn by a strong exhaust, a very desirable feature.

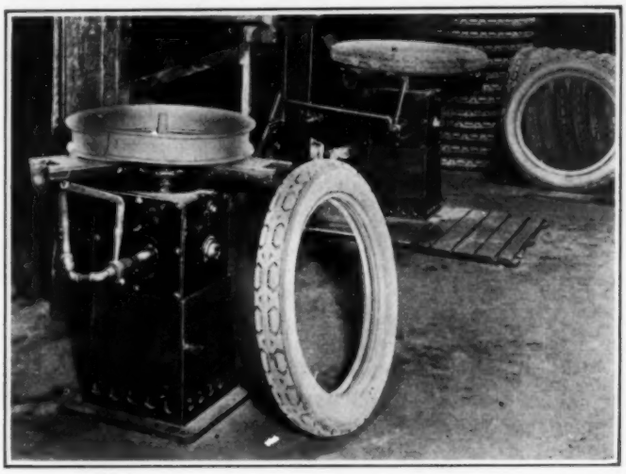


Fig. 7—Machine for putting tires on rims

The entrance to the drying oven is seen in the distance.

After leaving the drying oven the rest of the assembly takes place. In Fig. 3, the front fenders, running board and spare tire carrier are in place and the body is handled by a special monorail trolley that brings it in from the side to the proper point in the assembly line. A suitable framework supports the body and allows it to be lowered easily and accurately to the frame. Here the tops are carefully fitted and other necessary assembling carried on. The fenders can be see in the racks at the left.

The end of the conveyor track is shown in Fig. 4, the truck being visible under the four-door sedan body. It will be noted that a cross track for the wheels is provided at this point so that the car can be run off when the track carrying the truck is lowered. The truck then clears the car and rolls down the incline, which meets the lower track shown below the floor level. The cross track has openings for the truck wheels.

In Fig. 5 can be seen the other end of the conveyor track, showing a truck coming up out of the subway at *A*. When the truck advances a little further, the rails *B* and *C* are lowered to meet the track underneath and the truck is started back on its next journey. The conveyor chain is shown at *D*. The frame is laid on the truck upside down as at *E* and proceeds to the roll-over hoist, shown in the first illustration.

Leaving the conveyor line by means of the cross-track shown in Fig. 4, the car goes to the running-in stand, in Fig. 6. Here the front wheels are held by the depression at *A* while the rear wheels rest on power-driven, flat-faced pulleys beneath the floor. This gives a running test to the rear-axle assembly and, when the clutch is let in, to the motor unit as well. An unusual feature of the test stand is that the pulleys or drums under the wheels are eccentric and are so timed to give the car an excessive racking motion, similar to that due to an extremely rough road.

By moving the car forward so that the front wheels rest in the depression *B*, the rear wheels rest on concentric drums and a plain running test is given for as long as may be desired. The illustration also shows the gravity incline by which the already tired-wheels are fed down in the proper position to be assembled on the cars, as the finishing operation. At the extreme right is the bulletin board on which a record is kept of the cars as they are assembled.

Another little economy which aids in cutting down production costs, is the machine shown in Fig. 7 for collapsing the rims while the tires are dropped into place over them. Reversible air motors make the action positive in both directions and speed up the output. The two machines shown handle tires and rims very rapidly and enable two men to tire an astonishingly large number of rims per hour.

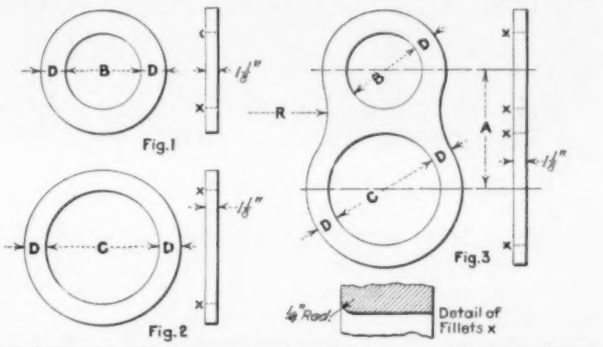
Standard Sizes and Shrinkage of Hub Bands

BY CLIFFORD H. FRENCH

The practice of banding locomotive driving-wheel hubs has been standardized on the Santa Fé System for all locomotives from 24 to 32 in. stroke. Three standard bands are used. The one shown in Fig. 1 is for use when the wheel is cracked in the crank pin hub; in Fig. 2, when the crack is in the axle hub; and Fig. 3, when the wheel is cracked between the crankpin and the axle.

A standard fillet of ¼ in. radius is used in all cases. The shrinkage allowances are as follows: Band over crankpin and axle, $\frac{7}{16}$ in. Band on crankpin hub. $\frac{5}{16}$ in. Band on axle hub, $\frac{7}{16}$ inch.

The table has been abbreviated to show one set of bands for an engine of each stroke, because the various



Band N°	Stroke	Dimensions A	B	C	D	R	Remarks
1	24"	11 15/16"	8 15/16"	11 15/16"	2"	8 1/2"	
4	26"	12 15/16"	7 15/16"	11 15/16"	2"	8 1/2"	
8	28"	13 15/16"	10 15/16"	12 15/16"	2"	8 1/2"	
12	30"	14 15/16"	10 15/16"	13 15/16"	2 1/4"	8 1/2"	
13	32"	15 15/16"	10 15/16"	13 15/16"	2 1/4"	8 1/2"	
16	34"	16 15/16"	12 15/16"	15 15/16"	2 1/4"	8 1/2"	

Fig. 1—Band for crankpin hub. Fig. 2—Band for axle hub. Fig. 3—Band for crankpin and axle hubs

locomotives having the same stroke would not be the same on different roads. The center distance *A*, however, is the same for all engines of the same stroke, and by maintaining the wall thickness *D* of the bands, the table can be modified to suit any locomotive of a given stroke.

Ideas from Practical Men

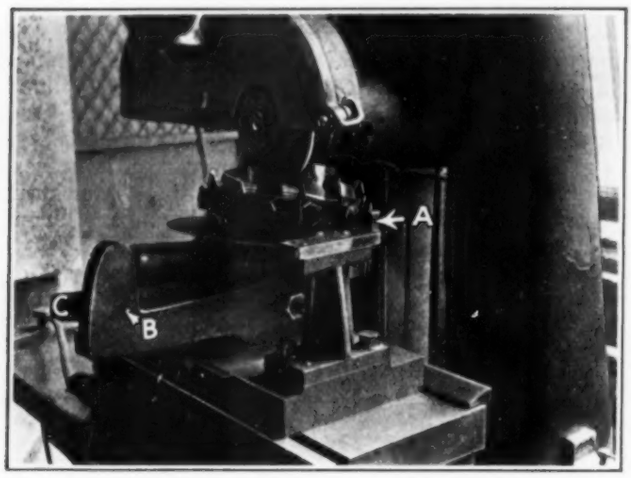
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

A Home-Made Fixture for Grinding Gleason Cutters

BY AMOS FERBER

In order to get the best result from the cutters used on the Gleason spiral bevel-gear generator it is necessary to hold the rake angles of the teeth to a very close tolerance, and a fixture in which to grind them is indispensable. The illustration shows a fixture designed and built in the Windsor, Vt. shops of the National Acme Co. for the purpose.

The base of the fixture sets on the magnetic chuck of the surface grinding machine and requires no setting up other than to swing it into place and close the switch.



Fixture for grinding Gleason cutters

The cutter to be ground screws upon the spindle nose of the device, which spindle is provided with an index plate having a double set of notches for positioning the teeth with respect to the grinding wheel.

The position of grinding wheel with relation to the center line of the device is obtained by means of suitable size-blocks placed between the inner face of the wheel and the permanent gaging post *A*, for which purpose the table of the machine is run to one side far enough to bring the wheel opposite the post.

The bracket in which the spindle is carried is separate from the base of the fixture and is gibbed to the latter in such manner that it has a movement of several inches in a direction parallel to the spindle of the grinding wheel. Its position at either end of the movement is determined by adjustable micrometer stop screws. The spindle also swings in a vertical plane, and its position at either extreme of the swing is made positive by the removable dowel pin *B*, which passes through aligning holes in the end of the lever *C* and the stationary bracket.

With the fixture in the position shown it is set for grinding alternate teeth of the cutter, the latter being spaced around at each pass of the table by means of the index and locking pin. The slide is then brought forward against its limiting stop, the dowel *B* withdrawn and replaced in the other hole with the lever in the lower position, the index pin engaged with the second set of notches in the plate and the device is ready to grind the intervening teeth.

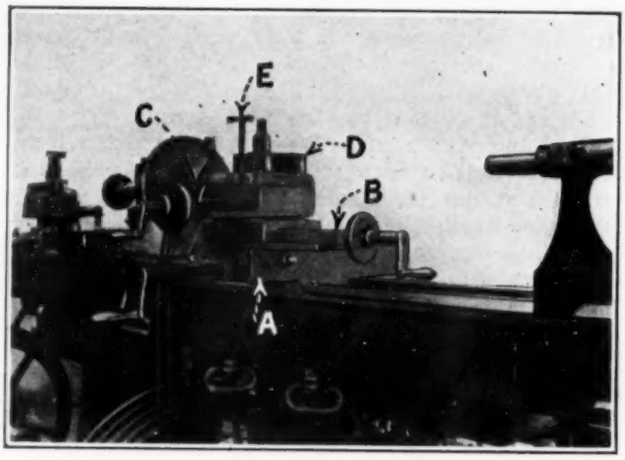
A Three-Deck Slide Rest

BY R. E. MARKS

Most slide rests of my acquaintance are two deckers, one slide being for longitudinal and the other for cross turning or facing. The upper slide usually swivels so that it can be used parallel with the ways or at any angle, the lower slide being fixed at right angles to the ways.

The illustration shows a German slide rest, on a German lathe, in the shop of Wm. Brandis & Son, Brooklyn, N. Y. It is a three decker and is designed especially for use in making surveying instruments. The lower slide is fixed at right angles to the ways, as usual. The other two slides swivel.

As shown the lower slide *A* is used for cutting off, the second slide *B* for lengthwise turning, either



A three-deck slide rest

straight or taper, and the upper slide *C* for turning or facing at an angle which is not 90 deg. The combination of slides allows two different angles, to be turned or faced, beside the cutting off, all without changing the setting of the slides. In this way pieces with different angles can be duplicated without difficulty.

The illustration also shows the quick acting, substantial tool clamp at *D*. It is a triangular piece with the screw *E* through one corner, the other corners bearing on the tool as shown.

Converting the Elements of Capstan Lathes from Push-Tube to Drawbar–Discussion

BY JOHN G. OLIVER

Although considerable discussion of methods for converting the elements of capstan or turret lathes from push-tube to draw-bar have recently appeared in the *American Machinist*, there is one important point that has not been considered. As a matter of fact, the device described by Mr. Hickling on page 118, Vol. 60, and discussed further by Mr. Freeman on page 632, is covered by a United States patent issued to Bardons & Oliver, Cleveland, Ohio. The device is also patented in various foreign countries so that the arrangement is not available at the present time for the use of the general public.

Fixture for Grinding Cut-Off Tools

BY MILTON WRIGHT

The fixture here shown is used for the purpose of grinding the cut-off tools used on Gridley automatics. The maker of this machine has thousands of such tools to grind, and, as there is but one best clearance angle, this and other fixtures are used in which to grind them. It consists of a ring of cast iron having radial slots planed in both sides to fit the shanks of the tools, which have previously been ground parallel and to uniform width and thickness on the magnetic table of the Blanchard machine.

The slots are planed in at an angle to the face of the ring equal to the clearance angle required on one side of the blade of the tool, being inclined in one direction on one side and in the other direction on the opposite side of the ring, as to grind both sides of the blades in

Grinding cut-off tools on the Blanchard

the same set of slots would result in producing parallel blades at an angle to the shanks.

When the grinding of one side of the blades is completed upon one lot of tools, the tools, bolts and straps are removed from the ring, the latter turned over and the tools placed in the slots now uppermost. As the tapped holes pass clear through the ring they are available for attaching the clamps on both sides. When loaded, the ring is centered on the magnetic table, the latter run under the wheel just far enough for the edge of the wheel to reach the shoulders—already forged on the tools—the table set in motion and the wheel fed straight down upon the work.

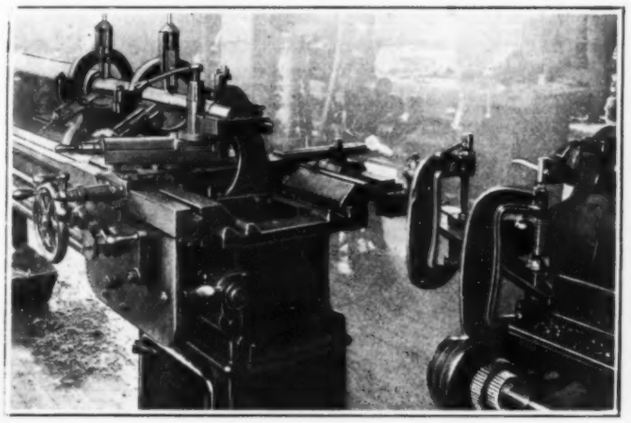
A fixture is also provided to grind the ends of the blades. This is merely a square block of iron with parallel slots planed in it equivalent to the clearance angle so that the tools stand practically on end, where they are held by straps and bolts in the same way. Of these latter fixtures, two or more are placed on the magnetic table midway between the center and the outer edge. The magnetism of the table is sufficient to hold either fixture.

Reaching Around the End of a Job to Bore It

BY JACK WILLIAMS

Recently we had occasion to bore a short tapered hole and chase an internal thread in the end of a shaft that was too long even to go between the centers of the longest lathe available in our shop. Instead of throwing up our hands and hollering for help from outside we did the work ourselves in the manner shown in the illustration.

With the tailstock of the lathe removed and the job



The job that was too long for the lathe

supported on the live center and by two steady-rests we still could not get the carriage back far enough for an ordinary boring tool holder to clear the end of the shaft, so we bent up an angle piece to go in the toolpost as shown and fitted to the bar that was to carry the boring and thread-chasing tools.

The regular taper attachment of the lathe was used to make the angular cut, but this attachment was so far along the bed that it could not be clamped in the ordinary way, so we connected it up to an adjoining lathe by means of sundry straps and C-clamps. All that this connection had to do anyway was to hold the attachment from sliding along the bed by reason of the friction of the taper block as the carriage moved.

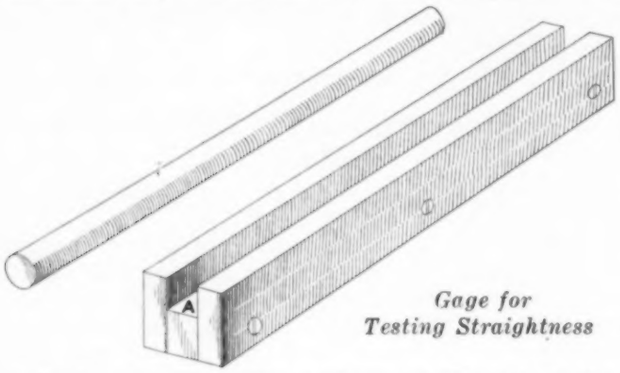
As our boring-tool holder was some six or eight inches to the right of the right-hand side of the cross-slide, it follows that our nearest steady-rest on the opposite side was none too near the cut to furnish the most advantageous support, so the follow-rest was bolted to the usual place at the side of the saddle and adjusted to bear on top of the work.

A Simple Go Gage for Long Stems

BY FRANK C. HUDSON

The Trundle Engineering Co., of Cleveland, Ohio, had some long stems or spindles to make, which had to be straight, as well as of the right diameter. After a little consideration it was decided to make a gage as shown.

The gage consists simply of three flat strips of steel, the center strip *A* being the only one that need be at all particular as to size. The thickness of this strip is the maximum diameter of the stem.



Gage for Testing Straightness

Having the other strips flat on the side next to the center strip, the three strips are fastened together as shown, making a channel which tests the stem for straightness. If the stem turns evenly or smoothly in the channel it is straight and usable for its purpose. For while a bent stem of small diameter would turn, it would bear at three or more points and would not turn smoothly in the gage.

Should the sides of the gage wear, it is only necessary to grind the sides flat on the side next to the center strip. No gaging or remeasuring is necessary, as there is nothing to wear the sides of the center or gaging strip *A*.

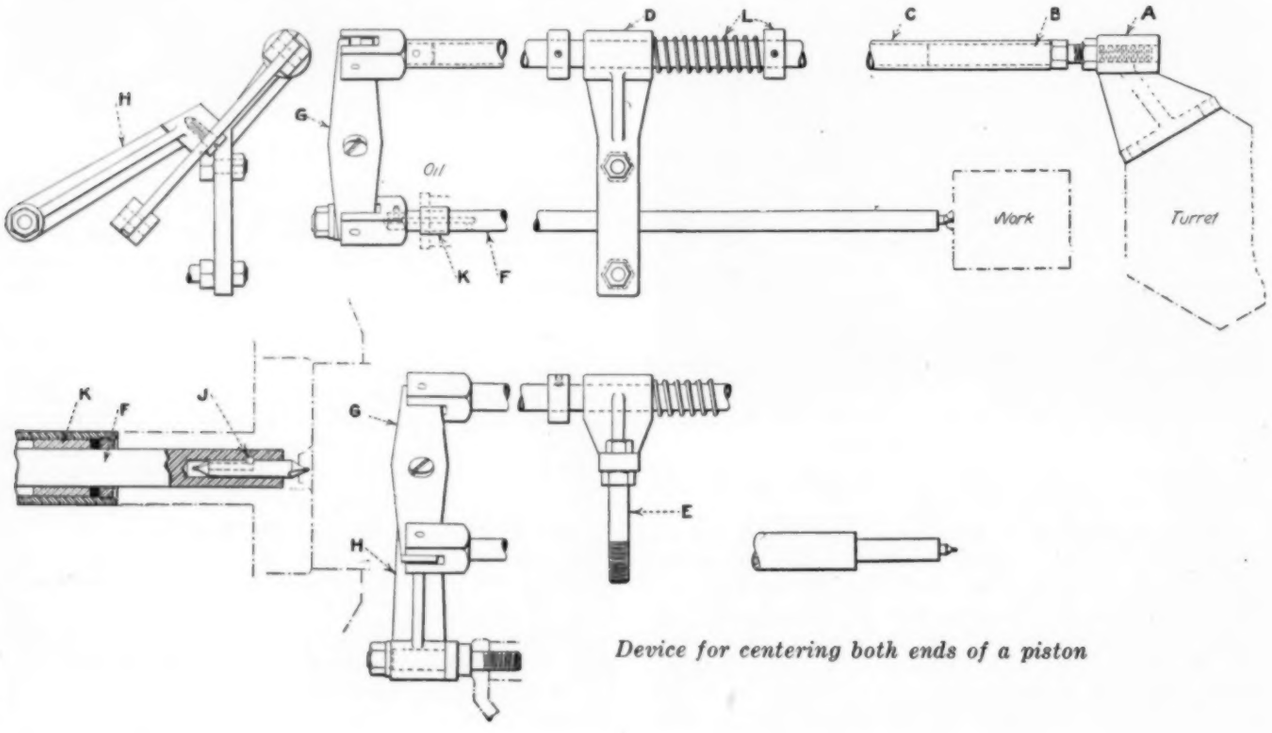
Centering from Both Ends in a Turret Lathe

BY HERBERT W. CABLE

The device herein described was used successfully to center both ends of a piston, while counterboring and facing on a Warner and Swasey turret lathe. The centering and counterboring of one end were done by a toolblock on the turret, and the facing from the cross slide. The other end was centered through the chuck and spindle of the machine, using a left hand center drill operated by the device shown in the accompanying illustration.

The variation in the outside diameter of the piston made it advisable to use a three-jaw chuck, as a push or draw collet would allow too great endwise variation in the depth of the centers.

The device, referring to the illustration, was operated as follows: Bracket *A*, attached to the adjacent flat of the turret, held the push rod *B*, which was a sliding fit in the tube *C*, and adjustable by means of a thread and lock nut. Bracket *D*, held to the front bearing cap of the spindle by the special cap screws *E*, formed a sliding bearing for the tube *C*. When the turret was advanced to counterbore and center, the tube *C* was pushed by the rod *B* and operated the rod *F* through the spindle, by means of the lever *G*. Lever *G* was pivoted on the bracket *H*, which was attached to the rear of the machine. Rod *F* was reamed at its forward end to receive the center drill which was driven by means of the pin *J*. The center drill was ground and notched to receive this pin, and thus given a positive drive. Rod *F* was kept from rotating by the fork and lever at the rear end, and was guided by a bronze bearing in the spindle at *K*. The mechanism was returned by means of a spring and adjustable stop-collar at *L*. Everything was fully adjustable to give the proper depth of the center, and the center drills were easily accessible for changing.



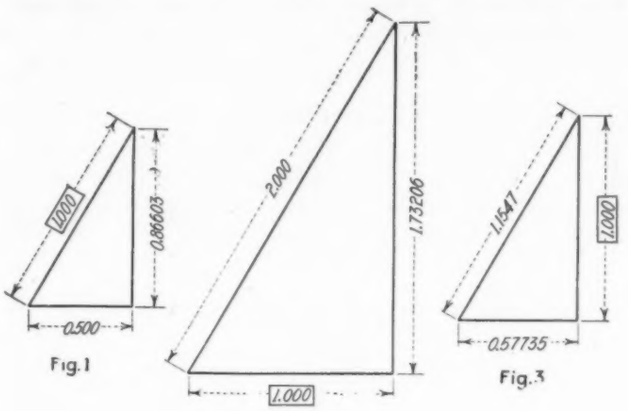
Device for centering both ends of a piston

30-60 Degree Triangle Calculations

By Edward Heller

In various calculations around the shop or drafting room, the 30-60 deg. triangle is so often used that the writer keeps the accompanying illustrations as a ready reference.

The illustrations show the proportions of the sides of



Figs. 1 to 3—Proportions of the 30-60 deg. triangle

the triangle when each of them in turn is taken as unity.

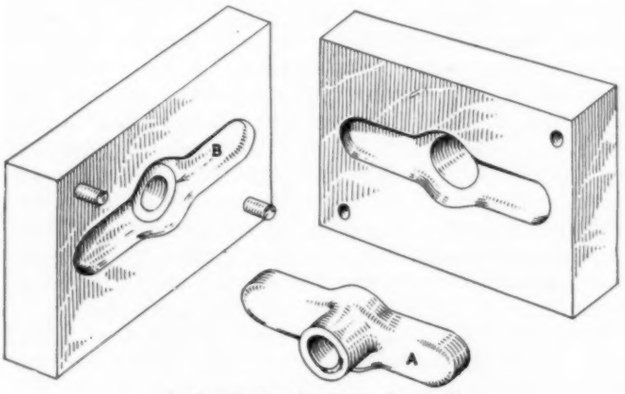
The values for the two sides when the hypotenuse is 1.000 are given in Fig. 1. Fig. 2 gives the values for the hypotenuse and long leg when the short leg is unity, and Fig. 3 gives the value for the two remaining sides when the long leg is unity.

A Rough Drilling Jig

By Charles F. Henry

A small shop had a lot of holding down clamps to drill for the bolts, through central bosses. One of the clamps is shown at *A*.

The patterns for the two parts of the drill jig were made from plaster of paris, using one of the clamps as



A cheap jig for rough work

a pattern for the depression in each part of the plaster block. The jig castings were made from the plaster of paris patterns.

When the two castings were made, a clamp was placed in one part of the jig, the other part placed over it, and the dowel holes drilled through both parts. Dowels with the points a trifle smaller than the bodies, were put in one part.

A hole was drilled in the center of the upper half for the bushing *B*, and when this part was in place, the jig was ready for business. This method makes a cheap but satisfactory jig for rough work.

Scale for Laying Out Angles

By John Homewood

In Fig. 1 is shown a Brown & Sharpe draftsman's scale with extra graduations for use in laying out angles.

The distances from the zero line to the tangent lines for various degrees are ten times greater than the tangents for a radius of unity, so that in laying out an

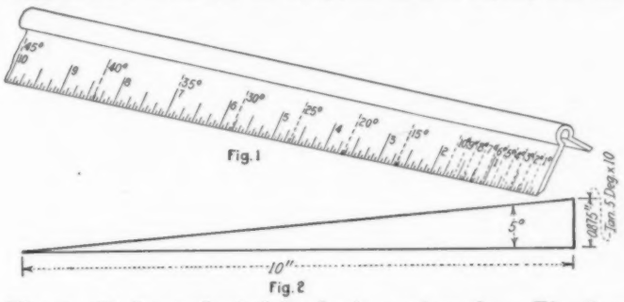


Fig. 1—Scale graduated for laying out angles. Fig. 2—The angle as laid out by the scale

angle, if the unit of measurement is one inch, the radius as shown in Fig. 2, should be drawn to a length of ten inches.

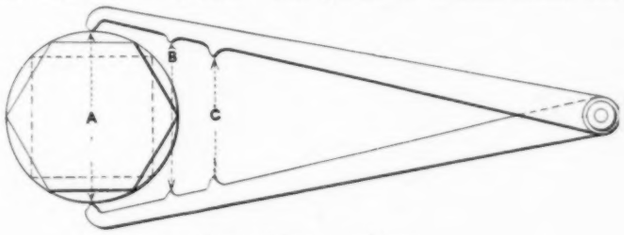
The graduations are for each degree from 1 to 10 inclusive and from 10 to 45 deg., varying by five degrees.

By thus multiplying the functions by ten, the scale will enable the draftsman to lay out angles with considerable precision.

A Handy Caliper for the Stockroom

By C. B. Mackay

A useful caliper for selecting round stock that will allow the finishing of an inscribed square or hexagon upon it, is shown in the accompanying sketch, and can be laid out as shown. The points *A* should touch the



A stockroom caliper

circle while the points *B* should touch lines extended from the opposite flat sides of the hexagon. Likewise the points *C* should touch lines drawn from the opposite sides of the square.

If the points *B* are set to the distance across a square of any size, or the points *C* set to the distance across the flats of a given hexagon, the distance between the points *A* will be the diameter of a round bar that will allow such square or hexagon to be machined upon it without waste.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Frank Bunker Gilbreth

IT IS said of some men that they were born a century or two too late, of others that they were born before their time. There is little question but that the late Frank B. Gilbreth was among those true radicals who see clearly some of the faults of the time and endeavor by all fair means to correct them and to lead others to a better and happier life.

Frank, as most of his friends knew him, was as ardent an enemy of waste as Herbert Hoover. He sought by a painstaking, analytical study of the worker's motions to increase his output and at the same time to lessen the fatigue connected with manual labor. Eventually he concentrated every effort on the determination of the "One Best Way to Do Work," and staunchly defended his slogan before engineering societies, in articles for the press and in lectures to college classes.

A contemporary and friend of Frederick W. Taylor, Mr. Gilbreth was an advocate of the Taylor principles but an implacable foe of the Taylor methods. His success under conditions that brought failure to Taylor and his disciples can only be attributed to his keen appreciation of the importance of psychology.

His indomitably cheerful personality will be sadly missed at gatherings of engineers where he was always the center of a laughing, jesting group.

Fortunately, his work will go on for he leaves behind him his wife and partner who is one of the best known industrial psychologists of our day. The sympathy of all who knew Frank Gilbreth goes out to her in her bereavement, but coupled with it is a sure belief that his work could not have been left in more capable hands.

Are Machine Tools Strong Enough?

HAS the time come when the machine tool is too weak to drive the cutting tool to its full capacity? This thought naturally follows upon hearing the evidence from a maker of twist drills that a 1½-in. drill, in breaking through a steel plate about 1½ in. thick, stalled the machine and the 70-hp. driving motor.

There is no doubt that the drill was being forced beyond practical possibilities. The operation was part of a spectacular exhibit not claimed to be practical but designed to show how far development work has progressed in making twist drills that have ultimate strength greater than is required by present machine tools. In the same exhibit a ¾-in. drill was pushed through cast iron at the rate of 105 in. per minute. The machine was running at 1,010 r.p.m., which meant that the feed per revolution was 0.104 in. These are not practical speeds and feeds and are not recommended but they do show possibilities and the demonstrations have their value for that reason.

If cutting tools are now going to surpass in capacity the machine tools on which they are used, the next big step for the machine tool builder is to strengthen his machines until they will again be stronger than the best cutting tools. If these developments take place a vast market will be opened for the better cutting tools and for the redesigned machine tools. Very much of the equipment now in use will have to be scrapped and, of course, the situation will result in additional economies and added profits for the users as well as the builders of machine tools.

Converts to Machine Equipment

THERE is at least one group of hand workers that is converted to the use of machines for their heavy work. This group is employed on foundation work. A good friend of ours, a consulting engineer, told us of his experience with these men and mechanically operated drills.

Three years ago an attempt was made by a contractor to employ mechanical drills for driving holes through heavy timbers, instead of the laborious hand drills in vogue. His men promptly walked out, actuated by the time-honored aversion of labor to innovations that seem to take work away from them.

Recently, on a similar job, a gang was supplied with a type of mechanical drill somewhat less efficient than the best one available. This gang also quit, but because they were not given the fastest operating equipment. They had learned that in a progressive country like ours there is plenty of work to be done and that the man who makes the best use of mechanical equipment gets the biggest financial return for his efforts.

May the idea spread!

Handling Costs Should be Reduced

IF ANYONE doubts the vital importance of plant layout and of careful planning in routing work through the plant, he has only to consider the facts given in the article on page 945 of this issue. Had the plant in question been originally planned for its current production it is quite probable that even the present cost of handling would not exist. At best, handling costs are higher than many of us realize.

With machining costs so low as to be almost unbelievable, it is astonishing to find that the mere handling of an automobile frame from the time it is delivered at the plant until it reaches the assembly line, is, in one case, one per cent of the total machining cost of the entire car, including an open body. Needless to say this can and will be materially reduced by different routing and more economical handling methods. The situation, however, shows very clearly that the problems of automobile factory executives are changing and are becoming more difficult as the industry develops.

Methods and layouts that were permissible in the days of small plants are largely responsible for the costs named. Adding building after building to the old plant, puts departments further apart and adds to the handling cost more rapidly than as though the whole plant had been laid out as a unit. This is one of the penalties of over-rapid expansion and one reason why some new plants can produce more cheaply than those that have grown from small units.

Belting Standardization at the du Pont Plants

By William Staniar

Engineering Division, E. I. du Pont de Nemours & Company

RECENT developments have forced the recognition that belting and transmission machinery are no longer necessary evils to be selected at random, and installed and operated by rule-of-thumb methods, but are essential and important parts of the plant operation, requiring and deserving as much care and attention as any other part of the mechanical equipment.

"Protection to the Manufacturer, Jobber and Dealer by Standardization of Belting and Transmission Machinery"—that word "protection" means something to this audience and you are no doubt wondering just how standardization can be made practical. Well—it can—but before telling you how I am going to give you first an outline as to the origin of the belting standardization system as put in force by the duPont Company.

The duPont Company has vast uses for belting and transmission machinery, because it manufactures a great variety of products and most all of them produce deleterious fumes and gases which are disastrous to belting and transmission machinery. This naturally creates unusually high costs to face in transmitting its power.

Eliminating Haphazard Belt Buying

At the close of the war the company was forced to make tremendous reductions in labor and plant equipment but even in the face of this problem, it concluded that the enormous consumption of belting and transmission machinery made it necessary to investigate the possibility of systematically regulating the selection and application of its belting. It was realized that if some practicable system could be developed for eliminating the haphazard selection of belting and transmission machinery, it would not only benefit the duPont company, but would also be a great help to industry at large, owing to the fact that preliminary investigations in many plants had shown that loss, due to the absence of systemmatic methods, was general.

Our studies for belting economies were actually started during December, 1918, at the largest chemical plant of the company where the consumption of transmission commodities was extremely high, due to the fumes of corrosive acids and every conceivable condition that is disastrous to this class of material. The studies were made from a strictly commercial standpoint; that is, with the object of ascertaining the most economical type and brand of belt for any given condition and load that would transmit power with minimum slippage, maintenance and depreciation. First cost was a factor, but was by no means the deciding element in the final selection.

Tests and studies of this character under actual operating conditions are frequently unreliable and at best consistent results are difficult to obtain because such tests are very strongly influenced by the opinions and prejudices of maintenance forces and operators. Therefore, particular pains were taken to eliminate the personal equation in this work.

Before and during the war, the belting used by the duPont company consisted chiefly of leather, stitched canvas and rubber, and, as no particular attention had ever been paid to belting and transmission appliances considerable latitude was allowed the individual designer in the selection of these power necessities.

Card records of a few installations were kept at some of the plants, but with apparently no tangible results. Card records of belting performance are good things, but if they are not comparative records of one type over another for given conditions, and the results put into practice, they are worthless.

Severe Conditions for First Test

To start the work, a building with severe acid operating conditions was selected, and new belting of various types was installed from the line shafting to the various pieces of apparatus. Immediate comparative results were obtainable as the conditions and loads were identical. Wooden signs eighteen inches square were placed over each installation for identification and recording purposes.

A special card record was kept of each test—the number of the card corresponding to the number on the sign over the operating belt. A man of exceptional transmission experience was assigned to keeping the records and making daily inspections of all belting undergoing test.

At one time one hundred and fifty belts were being tested, the results of which were amazing. In some cases the life was increased from nine to one hundred and fifty-four days, thirty to sixty days, four months to nine months, one year to two years, etc., with a similar amazing reduction in maintenance cost and a corresponding increase in production due to fewer shut-downs from the usual power troubles.

In one building as a result of the knowledge gained by this comparative testing, the shut-downs were decreased from eighty-three in thirty days, to twenty-nine in sixty days. In another, where trouble was being experienced as to capacity of Jordan grinding engines with a certain brand of belting, we were able, due to the knowledge gained, to correct the fault and increase the capacity of the machine forty per cent.

Results of Tests

Hundreds of power economies similar to the above specific cases occurred during this period of observation and testing. As a final result, certain definite knowledge of the life and performance of various types and brands of power media was in our possession, which had been acquired by the expenditure of considerable time, energy and money.

With this reliable data available, we were then in a position to determine the most economical belt for any given condition in the entire plant, owing to the fact that belts of various types had been tested under every typical acid, heat, steam, dust and moisture condition obtainable.

Our testing on individual drives scattered over this plant had revealed the possibility of lowering generally the following factors of transmission costs:

1—Initial cost of transmission material;
2—Repairs, replacements and readjustments;
3—Power lost between driving and driven pulleys;
4—Idle time of operators necessitated by interruption of transmission service;
5—Production loss due to idleness of machines dependent upon transmission service.

Therefore, with these facts and results before us, it

From an address delivered before the American Supply & Machinery Manufacturers' Association, Cleveland, May 20, 1924.

seemed advisable to apply this knowledge to each of the two thousand five hundred belt drives in this plant. To do this it was necessary to devise a practicable working method whereby the correct type, width and thickness of belt for each drive would be immediately available to the area belt-supervisor when renewal was required. This was accomplished by the following method, which has proven itself most practicable and economical under all plant operating conditions:

Specifications of every drive in the plant were taken and the data studied with regard to conditions, horsepower, speeds, diameter of pulleys, whether open or crossed, vertical or horizontal, clutch or shifter control, and last, but very important, the type of fastener, which in itself, when wrongly selected, is responsible for twenty-five per cent of belting breakdowns.

As the most important factors to the belt-supervisor are type, width and thickness, length and fastener, these items were selected for tabulation, so that when renewals were necessary the tabulation would show the correct and most suitable belt for the drive in question. The tabulations, or charts, as we call them, were arranged according to the various areas of the plant and the areas sub-divided into their various buildings, thus enabling each area to have its own individual chart.

The question will naturally arise in your mind—Was the expenditure for the general study justified? The actual expense for the entire survey at the chemical plant was approximately two thousand dollars. The system produced a saving of seven thousand dollars the first year of its operation, due to correct type, reduction in sizes and in maintenance costs.

In view of the actual savings, increased production and general betterment of transmission conditions at this plant, similar systems of chart standardization have been put into operation at all the large plants of the duPont Company, totaling many thousands of drives.

System Applied to Other Plants

Owing to the success experienced at the duPont plants, this system has been put in force at two of the largest plants of the General Motors Corporation; namely, The Hyatt Roller Bearing Company at Newark, N. J., and The Cadillac Motor Car Company at Detroit —the former having seven thousand five hundred individual belt drives and the latter approximately twenty thousand. The Hyatt schedules have now been in force and strictly followed for one and one-half years and it has been interesting to note, that, as their production labor costs advanced, their new belting consumption decreased due to the specifications of the chart system becoming active. Belting and transmission material costs generally fluctuate in direct proportion to production labor costs; therefore, the experience at the Hyatt plant makes the economy of the system obvious. The results at the Cadillac plant are not available as yet owing to the very recent application of the system.

The original Hyatt charts were similar to those used at the duPont plants, but were found to be impracticable on account of the length of belt being specified. In large production shops, re-arrangement of machinery is constantly going on; therefore, it was necessary to continually change the length figure on the charts. The difficulty was overcome by adopting the schedule system which divides the various machines into classes —specifying the drive, type of belt, width and thickness and fastener. The length is omitted so that the specification is applicable no matter where the machines are moved. As a result of this experience the schedule system was used at Cadillac.

This system can be profitably applied to every manufacturing plant in the country where the power is transmitted by shafting and transmission appurtenances and where there are approximately one hundred or more individual belt drives in daily operation. We have found that the economies are, in proportion, just as great in the smaller plants as in the larger.

Where Do You Get Foremen?—Discussion

By Entropy

A recent editorial on page 820, Vol. 60, *American Machinist*, stated that in one shop 40 out of 42 foremen had come up from within that shop. This is a large percentage and not to be expected everywhere. Nine out of ten, however, come up through some shop.

Almost every human activity has some kind of intentional training provided for it somewhere, with the exception of this one thing. We seem to have little or nothing offered for the training of foremen in what now is the largest job they have.

Most large cities provide night schools that will help men to get whatever of mathematics, mechanics or other technical knowledge they may need. There are cities where they can get economics of the usual text book variety, but when it is a matter of considering human nature as it is, and teaching men to lead their fellow men, we, as a nation, come pretty near falling down.

These men get much practice at their trade whatever it may be—machinist or something else. Up to the minute they take charge of a gang of men they work with materials; with things that stay put; with things that can't talk back nor reason falsely or otherwise. Then everything changes and their whole job becomes that of management of men. The materials sink into the background. They are still there and of the same importance as before in the production of finished work, but their part is to get men to give their best work for the benefit of the employer.

There are few places where men can go and learn this art. Where there are opportunities they are seldom taken by any considerable body of men. One such class offered every year in a center where ten thousand foremen could easily come, draws only fifty men. To be sure it is not advertised. No effort is made to sell the idea, but it is absurd that such a condition should exist.

The truth of the matter is that this need for training is not recognized by any considerable number of owners, managers or superintendents. And some of the few that do recognize it dismiss the thought with the belief that there is no one capable of giving such training. Whether this is literally true or not, it is certain that meetings of foremen under the direction of anyone who can keep them on the question and away from personalities must do a great deal of good. It should be borne in mind that foremen do not get the opportunity that superintendents and managers do to go about the country, see other plants and take part in conventions which will broaden their contacts. And it is most likely that if there was a demand for men who could train foremen in the art of managing men, there would be men who would rise to the occasion.

Shop Equipment News

Davis "Roto-Matic" Pipe Threading Machine

An automatic machine for the threading of electric conduit has just been developed by the Davis & Thompson Co., Milwaukee, Wis. It will be marketed by Wm. K. Stamets, Jenkins Arcade, Pittsburgh, Pa. The No. 2 machine will thread pipe from ½ to 2 in. nominal diameter, the No. 3 from 1½ to 4-in. pipe. As illustrated, the double-end machine is adapted to standard conduit which is made in 10-ft. lengths. For random lengths a battery of two single-end machines would be needed.

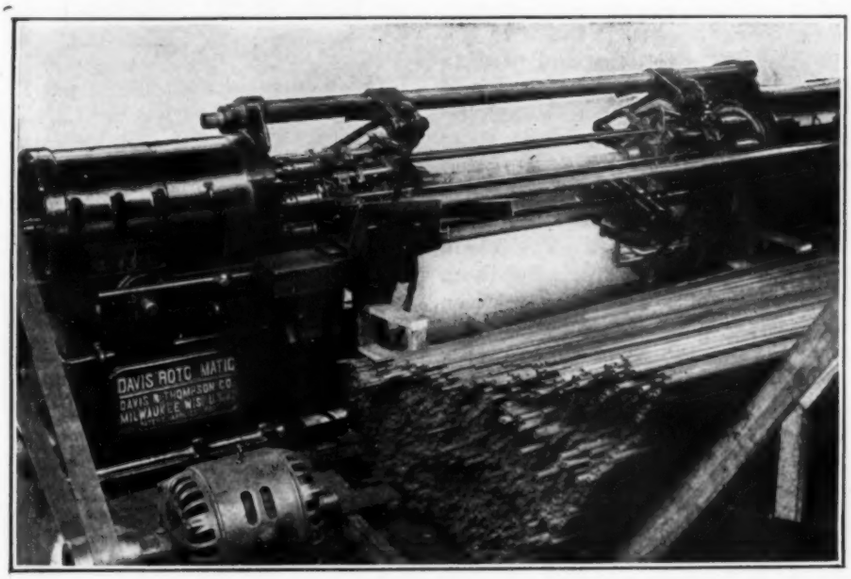


Fig. 1—Davis "Roto-Matic" Pipe Threading Machine

In general principles the Davis pipe threading machine is similar to other Davis machines of the rotating type. The six-station work spindle rotates in synchronism with the two six-spindle tool drums, one at either end of the machine. The loading side of the machine is shown in Fig. 1. It should be noted that to realize the full productive possibilities an overhead hopper or feeding chute should be supplied. The reason for this will be apparent when the output of the machine per hour, 2,400 ½-in. conduits, 10 ft. long, is considered. Hand loading at this rate for any length of time would be impossible. The finished work drops to the inclined ways shown in Fig. 2 and rolls out to be disposed of. The coolant dripping from the ends of the conduits and from the die heads is carried back to the two Rollway pumps shown in Fig. 2 over a series of screens and baffles and is recirculated.

A pulley at each end of the machine takes power through a belt from an electric motor. The pulley at the right of Fig. 2 drives only the cutter spindles of the head nearest to it. The pulley on the other end drives the cutter spindles on that end and also both spindle drums and the work spindle, by means of worm gearing off the shaft shown at the back of the machine. A friction clutch is introduced between shaft and pulley.

Six special self-opening dieheads are mounted on the cutter spindles of each of the two drums. Each diehead slides on its spindle and is backed by coil springs so that inequalities in length of the work up to 1 in. can be taken care of. As will be seen in Fig. 3 the diehead is brought up to the work by a large follower roller actuated by a stationary cam. The diehead is bell-mouthed so that slightly bent conduit can be drawn into it and centered, the work-holding chuck being arranged to float sufficiently to permit alignment. No positive feed is provided for the dieheads, each one pulling itself on the work, cutting a predetermined length of thread and then being tripped and returned to position. A tool inside the diehead chamfers the inside of the work.

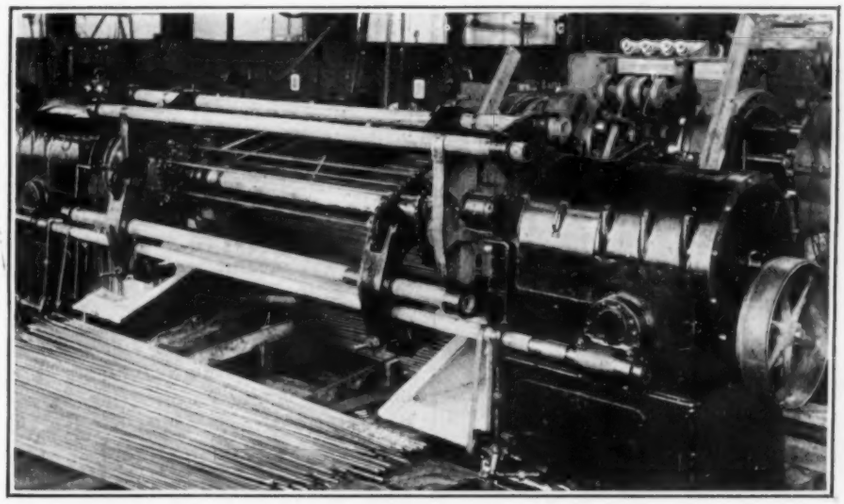


Fig. 2—Delivery side of "Roto-Matic" machine

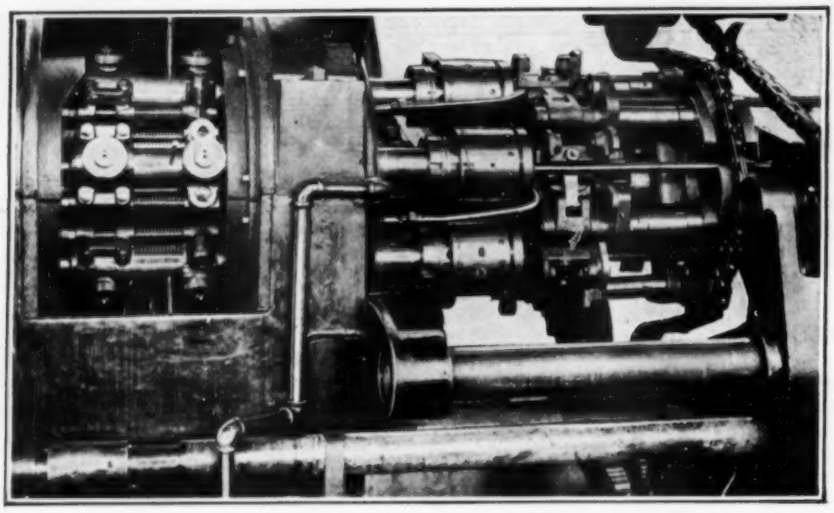


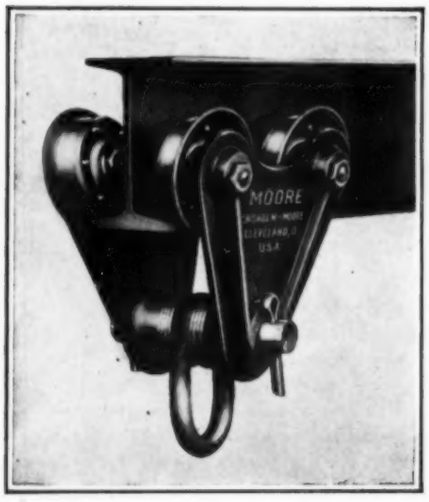
Fig. 3—Dieheads and chucks on "Roto-Matic" machine

The device for bringing coolant to the cutting elements is ingenious. Surrounding the face of the spindle drum adjacent to the work is an annular casting, U-shaped in cross-section. The legs of the U are packed where they join the drum so that a watertight chamber for the coolant is thus formed around the drum. The main feed pipe is tapped into the chamber as illustrated in Fig. 3. Alongside each spindle is a coolant pipe which is tapped into the face of the drum and connected to the coolant chamber by a passage. Perhaps one-third of the casting forming the coolant chamber is made solid so that the flow of coolant is cut off when the dies are not working.

As already stated the two-jaw work-holding chucks are allowed to float slightly to permit bent work to be aligned. They are closed by toggles operated from a short shaft which is given the necessary motion from a clamping arm located beneath the clamping chain visible in all three illustrations. The chain travels with the work spindle, there being no relative motion between chain and clamp. The desired tension is secured by means of the idler sheave shown.

Moore I-Beam Trolley

The Chisholm-Moore Mfg. Co., Cleveland, Ohio, is now marketing the light-weight trolley shown in the accompanying illustration. This device is made in one size only and will handle loads up to one ton. Since its weight is but 17½ lb. complete, it can be easily carried from place to place and used where needed.



Moore I-Beam Trolley

The pressed steel wheels have ball bearings built into them, so that the wheels and the bearings form complete units. The construction of the trolley is such that there is sufficient flexibility to distribute the load equally on all four wheels. The side frames are made of steel and are adjustably spaced by washers on the equalizing pin. There is sufficient adjustment so that the device can be made to fit any size of I-beam from 4- to 7-inch.

When the I-beam is closed at both ends, the device can be disassembled by taking out the equalizing pin, and reassembled on the beam. Should it be necessary to have the hoist higher than the link will carry it, the link can be removed and the hook of the hoist placed directly on the equalizing pin.

Thomas Wrenchless Quick-Acting Chuck

Supplementing the Barker wrenchless chuck which it has manufactured for some time, the Thomas Elevator Co., Hoyne Ave. and Monroe St., Chicago, Ill., has recently developed and is now marketing an improved type of wrenchless quick-acting chuck. It is said that this chuck incorporates features that tend to give it remarkable ease in operation on the heaviest kind of chucking. One of the advantages of the device for multiple production work on pieces of uniform outline is the fact that it is not necessary to stop the rotation when chucking or ejecting the piece. The chuck is equipped for Alemite lubrication.

Federal No. 50 Dial Indicator

The Federal Products Corp., 15 Elbow St., Providence, R. I., has added to its line the dial indicator shown in the accompanying illustration. The dial is graduated to half-

Federal No. 50 Dial Indicator

thousandths and reads to 0.015 in. as a plus-or-minus gage, or it may be read cumulatively in one direction. The capacity of the instrument at any one setting is 0.090 in., corresponding to three full revolutions of the pointer.

The indicator is provided with a bezel lock and a rotating bezel so that the zero line upon the dial may be brought into coincidence with the pointer in any position of the latter. It can be disassembled readily by removing the cap and withdrawing four screws.

"Grand Rapids" Universal Cutter and Tool Grinder

The Gallmeyer & Livingston Co., Grand Rapids, Mich., has just placed on the market the machine illustrated, known as the "Grand Rapids" universal cutter and tool grinder. The machine is made in two sizes, No. 3 and No. 4. Both have a swing of 10½ in., transverse movement of

No. 4 "Grand Rapids" Universal Cutter and Tool Grinaer

10 in., and vertical movement of 10¾ in. The longitudinal travel is 18 in. on the No. 3 and 24 in. on the No. 4 machine.

On these machines the wheel head, headstock, column and table can be swiveled in a horizontal plane and the headstock can be swiveled in a vertical plane also. Wheels are mounted on both ends of the spindle. Traversing of the table in either direction is possible from either front or rear of the machine.

There are no overhead works in connection with the motor drive. Individual motors drive the wheel and work spindles, the wheel motor being mounted in the base and the work spindle motor on the headstock. The work spindle is gear-driven, two speeds being available. The drive to the wheel spindle is through a flexible coupling to a shaft on the base of the machine and passing under the coolant tank. On this shaft a two-step cone is mounted and from the cone a belt carries the power to the spindle pulley, after passing under an idler jack in the base of the machine. Other idler pulleys give large arc of contact of the belt on the spindle pulley and serve to keep the belt on the pulley when the head is swiveled. A shifter is provided to slide the cone, thus changing the spindle speed, the idler jack serving to maintain the belt tension.

In addition to the cone pulley, the drive shaft carries a pulley for driving the pump, which is mounted on the tank cover, and a two-step pulley to drive the feed cone. There are four power, or automatic, feeds, two obtained by means of gears and two by belt. The gears are enclosed and run in oil. In addition to the power feeds the table can be traversed by hand either rapidly or slowly. The slow feed is obtained by means of a hand wheel and rapid traverse by means of a lever.

The work spindle is bored for No. 12 B. & S. taper and bushings are provided to accommodate shanks of B. & S. taper down to No. 7. The center may be used as a live center or a dead center according to the requirements of the work.

For internal grinding the wheel-spindle head is bolted to the regular wheel head, just below the pulley. The T-slot provided is shown in the illustration. Drive is by belt, from the regular spindle, where a pulley replaces the right-hand wheel. A speed of 1,960 r.p.m. is obtainable.

A taper shank chuck is provided to fit the work head and jaws for internal and external clamping are furnished.

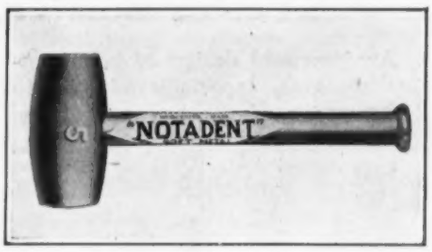
The vise has its own base and can be swiveled in two planes. The rear jaw also can be swiveled and the front jaw is removable to be replaced by a V-block or a jaw of special shape. The vise can be mounted on the base of the cutter-holding fixture, an arrangement giving an additional swivel.

The cutter-holding fixture has a double-swivel base, and can be used alone or with the vise, a combination that will give any angle desired. The top and bottom surfaces of the fixtures are machined so that tool rests can be fastened to them.

Net weights with standard equipment are 1,500 and 1,550 lb. for the Nos. 3 and 4 respectively.

"Notadent" Soft Metal Hammer

The New England Sales & Engineering Co., 4 Walnut St., Worcester, Mass., is now marketing the "Notadent" soft metal hammer shown in the accompanying illustration. These



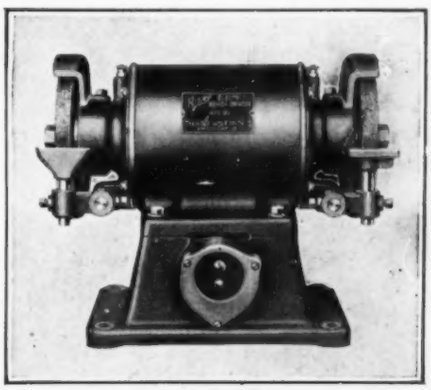
"Notadent" Soft Metal Hammer

hammers are made in six sizes, three of which are of babbitt and three of bronze.

The babbitt hammers are furnished in 3-, 5-, and 8-lb. sizes, the weights of the bronze styles being 2½, 4, and 5½ lb. respectively. It is stated that the hammers will stand rough usage.

Hisey 6-In. Two-Wheel Bench Grinder

The bench grinder shown in the accompanying illustration has recently been added to the line of grinding equipment manufactured by the Hisey-Wolf Machine Co., Cin-



Hisey 6-In. Two-Wheel Bench Grinder

cinnati, Ohio. The machine is similar in design to the larger machines made by this company and is adapted for very light grinding.

The spindle of the machine is mounted on high-grade ball bearings and the ¼-hp. motor can be furnished to suit any current requirements. The motor switch is enclosed in the base and incorporates a thermostatic

control that protects the motor. The spindle bearings are completely enclosed and provided with felt protector washers.

The machine can be fitted with the standard open wheel guards or with the safety combination guards recently developed by this company. The safety guards are adjustable for different sizes of wheels, have removable end covers and are fitted with exhaust pipe connections. The grinding rests are adjustable and can be removed.

Foster Bolt Turning Machine

An improved design of bolt turning machine, especially adapted to the turning of the rod and frame bolts used in railroad work, is now being marketed by the Walter H. Foster Co., 50 Church St., New York, N. Y. This machine is a development of a machine formerly made by this company, the main points of difference being the use of an adjustable cutter head and the feeding of the cutter over the work instead of the work through the cutter.

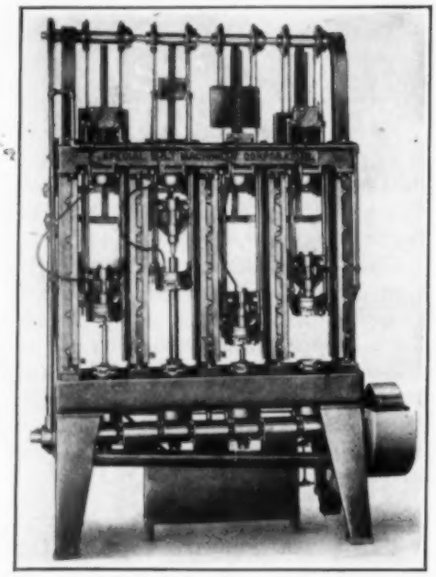


Fig. 1—Foster Bolt Turning Machine

A front view of the machine is given in Fig. 1, and it will be noted that there are four independent units, the bolt forgings being located on centers with the shank ends uppermost. The driving heads are mounted in the base of the machine, the upper ends of the forgings being centered in tailstocks that are adjustable vertically on guides to accommodate blanks of any length within the capacity of the machine. On the top of the machine frame are mounted the feed screws by which the motion of the cutter heads is obtained. Self-releasing nuts are threaded on the screws and are connected to the cutter heads by two push rods so that the cutters are pushed downward as the nuts move along the screws. Each feed nut is equipped with a trip rod, arranged to open the nut and disengage the feed motion at the end of the cut.

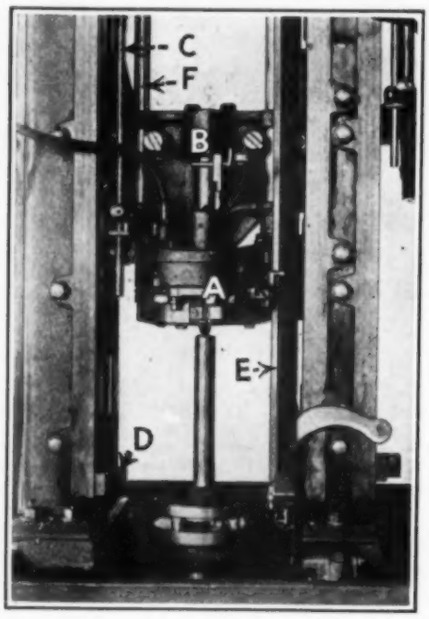


Fig. 2—Machining elements

A closer view of the machining elements is shown in Fig. 2. The cutter head *A* is attached to the feed nut by the rods *F*, of which only one can be seen, and the trip rod *C* disengages the feed when its lower end contacts with the stop *D*. The head of the bolt is carried in the driving head as shown and the shank end is centered in the tailstock *B*. The position of the tailstock center and spindle is controlled by a wedge arrangement, the center being resiliently pressed into the work.

Four cutters are pivoted in the cutter head, their position being controlled by a horizontal ring that encircles the body of the device, and to which the cutters are connected by suitable links. A roller attached to the ring bears against a vertical guide bar *E*, Fig. 2, so that the finished diameter of the bolt is determined by the position of this bar.

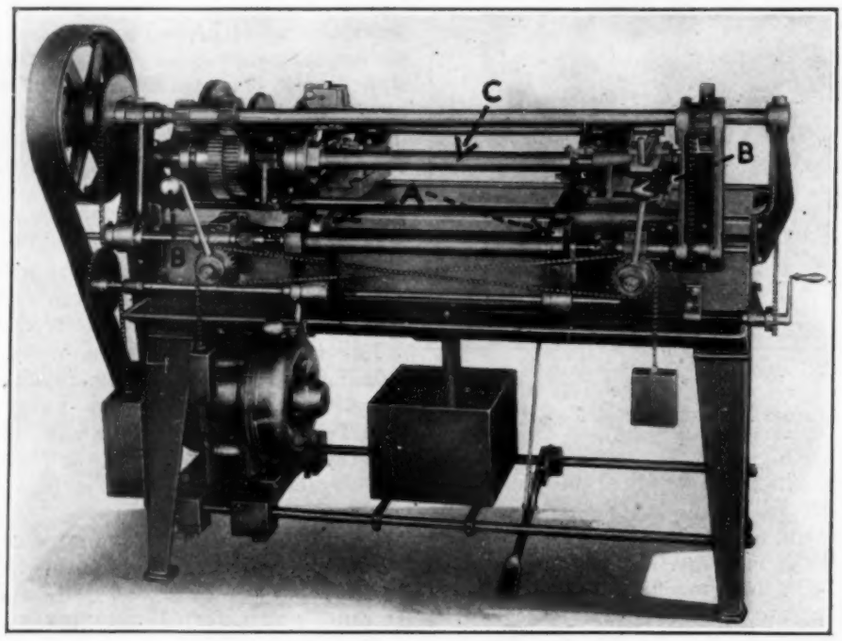


Fig. 3—Foster auxiliary centering machine

For taper bolts the guide bar can be inclined at the proper angle and the cutters will then open as they descend, producing the proper taper on the work.

The driving mechanism for the spindle consists of a wormwheel attached to the spindle and meshing with a worm, the spindle and gears being entirely enclosed in a housing attached to the base of the machine. The shafts of the driving worms for the various units are in line and are connected by Oldham couplings, so that any unit may be removed from the machine at any time without disturbing the rest.

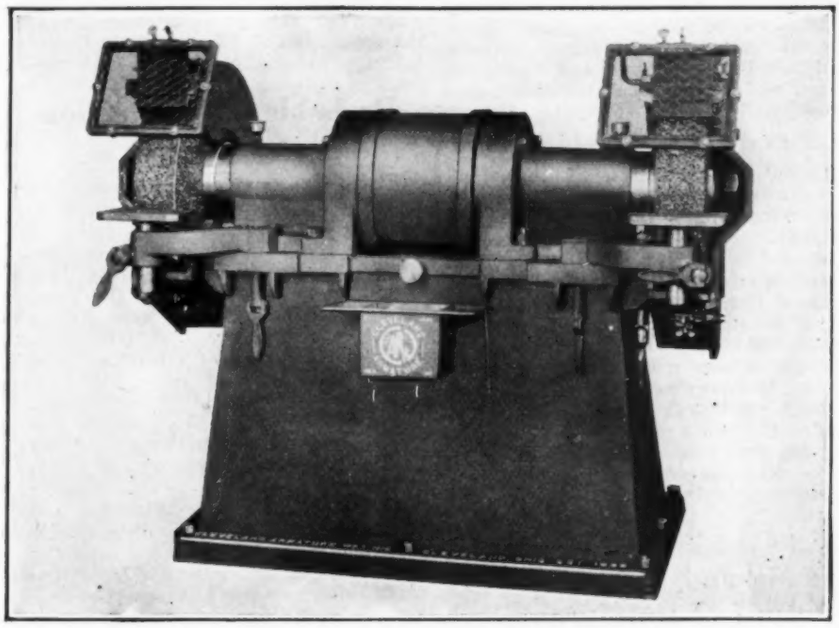
Before the bolts are placed in the turning machine it is necessary that they be properly centered, and an auxiliary machine for drilling the centers and facing the bottom of the head is shown in Fig. 3. The bolt blank is first placed in the centering chucks *A*, and the center drills are then brought up by the hand lever *B*. The centered blank is then lifted and placed between centers, as indicated at *C*, and the treadle is depressed. This engages an automatic mechanism that completes the facing under the head and shapes the point of the shank, the operator being free to center another blank.

The tool slides for the facing and pointing tools are actuated by cams on a camshaft geared directly to the main spindle and located at the back of the machine. Roughing and finishing tools are used for the facing operation and a forming tool is used on the point. The driving motor is belted to a jackshaft at the top of the machine, the main spindle being driven from the jackshaft through change gears for varying the speed. The center drill spindles are also driven from the jackshaft. The main gears on the spindle are provided with a clutch and the depression of the treadle engages this clutch and starts the machining of the blank. A timing disk keeps the clutch engaged until the facing and pointing operations are completed and the tools have returned to their original positions. The spindle then stops until another blank has been placed in position and the treadle again operated.

The centering machine will operate on bolts from 6 to 25 in. in length and of various diameters.

Cleveland Heavy Duty Grinder

A heavy duty floor type grinder is a recent addition to the line of grinding equipment manufactured by the Cleveland Armature Works, 4732 St. Clair Ave., Cleveland, Ohio. The machine is featured by a motor drive, taper roller bearings for the grinding spindle, and a number of construction features that make the adjustments and the manipulation of the machine convenient.



Cleveland Heavy Duty Grinder

The motor is designed and built by this company especially for the service required by this machine. The windings are well-insulated and treated with an oil-proof compound. The stator rings and steel tie rods are electrically welded before machining, and the rotor bars and rings are also welded. The stator laminations are exposed to the air to reduce heating under overloads and large fans are provided at each end of the motor to promote cooling.

The spindle is made of chrome-nickel steel and is mounted in taper roller bearings that can be adjusted readily to compensate for wear. The wheel flanges are of steel, the inner flanges being keyed to the shaft. The work rests are of steel and are provided with the usual adjustments.

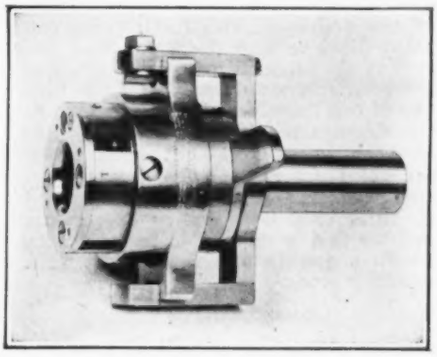
Wire glass eye shields are mounted in metal frames attached to the wheel guards, and steel plates in the upper guard openings are provided to deflect sparks and wheel fragments in case of fracture. The wheel guards are steel castings and swing covers are hinged at the ends, protecting the shaft ends and the wheel nuts. A positive shaft lock is furnished to hold the shaft stationary while the wheels are being changed. The heavy base of the machine is filled with concrete to reduce vibration.

The spindle center is 34 in. above the floor. The machine is built in two sizes, equipped with 10- and 15-hp. motors, respectively, and with capacities for 18- and 20-in. wheels.

H & G Improved Style D Diehead

The Eastern Machine Screw Corp., Truman and Barclay Sts., New Haven, Conn., has recently improved its style D diehead for Brown & Sharpe automatic screw machines.

As shown in the accompanying illustration, two arms from the floating shank, instead of one, provide a double drive effect that reduces friction and prevents any tendency to cramp while threading. This style of head is said to increase the production possibilities of the equipment and to provide threads of superior quality. The following sizes are available: $\frac{5}{8}$-in. for the No. 2 machine, $\frac{7}{8}$-in. for the No. 0 machine, and $\frac{1}{4}$-in. for the No. 00 machine.



H & G Improved Style D Diehead

When equipped with a handle for closing by hand, this head is adapted for use on hand turret machines.

News of the Week

Timken-Detroit Axle Company Centers All Work in One Plant

Cleveland plant and one Detroit plant to be closed

A reorganization of its business which will wipe out approximately $3,700,000 of its surplus through writing off equipment and machinery and entail the closing and disposal of two of its plants has been decided upon by the directors of the Timken-Detroit Axle Co. The plants to be closed are the Waterloo Avenue plant and the Standard Equipment plant in Cleveland. Work will be centered in the company's Clark Avenue plant.

The company's surplus at the end of 1923 was $4,517,769.18. A notice sent to stockholders, informing them of the company's intention to close the two plants and dispose of the equipment, says that surplus will be reduced to around $800,000.

In a letter to stockholders, explaining its action, the company says in part:

"Since the post-war boom there has been greater axle capacity than the industry needed. The resulting competition has been so keen that contracts for large quantities of the smaller sizes of axles have been taken at cost or less, in an effort to keep the plant filled up and thereby reduce the cost of the larger sizes. Even this has not been successful because of the failure of our customers to take the quantities contracted for, and the inevitable increase in overhead expenses when schedules are radically reduced. Furthermore, our organization is trained to build only one quality of product and we find it impossible to build at a profit, a quality axle and sell it at a quantity price.

CLOSE TWO PLANTS

"Therefore, the directors have decided to close the Waterloo Avenue plant and the Standard Equipment plant in Cleveland, and to discontinue the manufacture of axles for medium and low priced cars, and to confine our efforts on passenger car axles to the few makes of cars which require and can pay a fair price for a product of the highest quality.

"For many years our Clark Avenue plant has been manufacturing axles for trucks and for a few high priced passenger cars. During the past three years the demand for bus axles has been gradually increasing, until now it is an important factor. All of this business demands the highest quality of workmanship. We now plan to add to this volume the quality business which we retain from our other plants. By doing this we will comfortably fill the Clark Avenue factory, and will be able to manufacture economically, as we will have a large volume of high-grade work confined to one plant.

"The value of the machinery and equipment which is no longer to be used and for which there is no immediate sale, will be written off the books. This equipment will then be liquidated as advantageously as possible, resulting in a large saving annually in depreciation and maintenance. The land and buildings will still be carried on the books and it is expected that the fireproof buildings can be leased for a sufficient sum to cover all fixed charges on the property, until such time as it can be disposed of to advantage.

"Current inventory of parts for the axles we are discontinuing will be reduced to a minimum before the plant is closed and in so far as possible any surplus will be sold to our competitors who take over the manufacture of these models. Patterns, dies and tools for these models will be similarly disposed of.

FINANCIAL POSITION IMPROVED

"After the reduction of the plant account mentioned above there will still remain net tangible assets of approximately $3 for every dollar of preferred stock outstanding. The book value of the common stock will be reduced from $15.50 to about $11 per share, leaving a surplus of approximately $800,000. The financial position of the company will be materially improved as we will have the same amount of liquid capital with which to do a smaller and more profitable volume, and there will be left on the books plant investment commensurate with the potential amount of desirable business."

Canada and Mexico Supply Half of Immigrants

The establishment of immigrant quotas from all except the two border countries has so changed the immigration question that nearly half of our prospective citizens now come from either Canada or Mexico. There is also a slight excess of women over men in recent years. Canada has been sending an increasing number since 1921, the figure for that year being 52,929 while in 1923 it had increased to 182,369. Over 17,000 Canadians left us in the four years of 1920-23 inclusive but the net gain was 366,611 during that period.

The estimates of Dr. Willard I. King give a population on Jan. 1, 1924 of 112,826,000. The reports of the Bureau of Immigration shows that during the past four years we have had a net alien immigration from Italy of 258,326, from the United Kingdom 244,780, Mexico 167,497, Germany 126,974 and from Poland 83,520, beside the Canadians previously referred to.

Hoover Says St. Lawrence Waterway Is Inevitable

Secretary Hoover, of the Department of Commerce, believes that the deepening of the St. Lawrence River so as to allow ocean going vessels to reach the Great Lakes is inevitable, according to a report from Montreal, where he has been recently on a tour of inspection. Mr. Hoover is a member of the United States Commission on the St. Lawrence waterway and power project and believes that the growing pressure of population in the mid-west section of both countries will force the completion of this project regardless of the opposition of Eastern capital.

Probable Electrification of Railways

Financiers and railroad executives in different sections of the country are said to be seriously considering the extension of electrification of their lines. The problem of getting funds seems to be answered by the recent offerings of bonds which were disposed of without difficulty. As pointed out by manufacturers of electrical equipment, only about 4 per cent of the trackage which could be economically electrified has been so equipped, there is much work to be done and they believe that some might well be started in the near future.

Among those who are planning large electrical extension is the Pennsylvania Railroad, although there are conflicting reports as to the sections to be equipped first. Reports vary from the Philadelphia and Washington division to the mountainous Philadelphia and Pittsburgh, and also the New York division, on account of its heavy and continuous traffic. No dates are given but many feel that commencement work cannot be long delayed.

The delivery of the last 12 electric passenger locomotives to the New Haven by the Westinghouse-Baldwin companies, makes it possible for this road to abandon steam locomotives entirely between New York and New Haven, thus completing plans started in 1903. Trains which leave the main

line at various points will receive steam locomotives at the branching points but no steam locomotives will be used on the main line. Several economies are expected, among them the elimination of corrosion of overhead structure from the escaping steam and gases and the reduction of insulator maintenance.

While numerous railway officials admit that they have extensive electrification plans under consideration they will not commit themselves as to dates of contracts and intimate that they are some distance in the future. It is believed however that the ability to get money may bring the letting of contracts nearer than seems to be indicated by the official reports. Contracts for electrical machinery would add much to the general activity in the machinery market and it is hoped that announcements will soon be made of the beginning of this much needed work.

Railroads May Buy Shop Equipment on Installment Plan

It is reported that a program of purchasing shop equipment on the installment plan is under consideration in some railroad shops. The plan advanced is for the railroads to pay from 20 to 30 per cent of the cost in cash and to give a mortgage on the equipment for the remainder. This plan is now being followed in the purchase of rolling stock and has worked out very advantageously.

The argument has been advanced that while almost any road can use this plan to purchase rolling stock there has been difficulty in financing the purchase of shop equipment with which to keep the rolling stock in condition.

Reference to such an arrangement was made by John Purcell in his address before the American Railway Association at Atlantic City the middle of this month. He said, "A new development in connection with financing additional facilities of certain types has been brought forward in the last few years, whereby the manufacturers will arrange for the financing of an installation on a plan somewhat similar to the equipment trust certificate system. This plan may prove of great assistance where a railroad's financial condition is such as not to permit the immediate necessary expenditures."

Two Hundred American Engineers Sail for Conferences Abroad

British Empire Exhibition held at same time

The Cunard liner Scythia sailed on June 19, carrying 200 engineers for the World Power Conference to be held in London from June 30 to July 12. This conference is in connection with the British Empire Exhibition and will include papers and discussions on the various phases of power generation and distribution in different parts of the world.

DIVISIONS OF CONFERENCE

The different divisions of the conference include power resources, production, transmission and distribution and utilization. There is also a general session which includes the economic, financial and legal sides of the electrical power questions, and a section on research, standardization, etc. One of the important papers in this section is on national and international standardization by C. Le Maistre of Great Britain.

Following the conference in London there is a meeting in Geneva, Switzerland, on electric lighting, this in turn being followed by the first international management congress in Prague, Czechoslovakia, from July 21 to 24 inclusive. The latter conference is held under the auspices of the government of Czechoslovakia, the Masaryk Academy and the principal American engineering and management associations and organizations.

The program for this conference is filled with subjects on matters of real importance, such as scientific management, the human element in industry, industrial and group relations, profit sharing and ownership participation. General budget control, production management, sales management, management of coal and transportation industries, city and state management, and vocational education are also among the subjects to be discussed at Prague. The entire program indicates the progressive tendencies of the officials and engineers of the new republic and gives promise of developments which may be of value as an example to the rest of the world.

AMONG THOSE SAILING

Among the engineers who sailed on the Scythia were: Harold V. Bozell, editor of *Electrical World;* Gano Dunn, president J. G. White Co.; W. H. Eaton, Westinghouse Electric & Manufacturing Co.; W. L. R. Emmet, General Electric Co.; D. S. Jacobus, Babcock & Wilcox Co.; Fred R. Low, president of the American Society of Mechanical Engineers, editor of *Power;* Prof. Chas. E. Lucke, Columbia University; George A. Orruk, New York Edison Co.; Calvin W. Rice, secretary A.S.M.E.; Elmer A. Sperry, Sperry Gyroscope Co., and Roy V. Wright, of the Simmons Boardman Co.

No Change in Earnings but Employment Decreased During the Month of April

A further recession in manufacturing activity is shown by the latest figures compiled by the National Industrial Conference Board of 247 Park Ave. Although there was no significant change in earnings in April, employment declined 2.5 per cent from the preceding month and the average hours of work fell off nearly half an hour a week. From approximately 1,700 plants which furnished data to the board, ten reported a shut-down in April and 150 others were working less than normal hours.

Average hourly earnings of all wage earners dropped slightly from 56.1c. in March, to 56c. in April. Fifteen industries reported decreases, in seven there were increases and one showed no change. For the most part declines were small. Hourly earnings in leather tanning and wool dropped rather sharply. Lumber and mill work was the only class in which a noticeable increase occurred.

Average weekly earnings of all wage earners declined from $26.89 in March to $26.67 in April. In 16 industries weekly earnings decreased, in six they increased and in one there was no change. Except declines in silk and wool and increases in lumber and mill work and paper and pulp, changes in weekly earnings were not significant.

An upward movement was noticeable in "real" earnings, or the purchasing value of money earnings, due to the drop in the cost of living between March and April. "Real" weekly earnings of all those employed in April stood 32 per cent higher than in July, 1914.

Total employment again fell off, the index number based on June, 1920 dropping from 84.8 to 82.7. Marked declines in employment were reported in the following industries: agricultural implements, automobile, boot and shoe, chemicals, cotton manufacturing, meat packing and silk. Only three industries showed increases.

Machinery Markets of Canada and Mexico Compared

Canada and Mexico have reversed positions as markets for American machinery since 1921. Canada now stands first as an outlet for machinery, and Mexico fifth. In 1921 Mexico was first. Exports of power-generating machinery to Canada increased over $1,000,000 worth in 1923. The table shows figures compiled by the Department of Commerce.

MACHINERY EXPORTS TO CANADA AND MEXICO

Class	Canada		Mexico	
	1922	1923	1922	1923
Power generating machinery, except electric	$3,83[illegible],673	$4,848,012	$1,221,953	$1,042,695
Construction and conveying machinery	1,587,311	2,485,068	438,599	536,754
Mining, oil well and pumping machinery	1,516,733	2,162,521	2,641,830	2,488,823
Metal working machinery	1,630,584	2,956,589	446,920	585,728
Textile, sewing and shoe machinery	1,976,989	2,408,749	249,129	258,146
Miscellaneous other machinery, except agricultural	12,356,122	12,510,145	3,743,025	2,915,177
Total	$22,897,812	$27,371,084	$8,741,456	$7,827,323

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor *Commerce and Finance*, New York

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THE irreducible minimum of American business averages at least a billion dollars a day. This sum represents the cost of the services and goods imperatively required by the 113 million people who inhabit the United States. Their normal wants must be supplied and the business generated is fairly constant in volume. But with the exception of the wheat market, where prices have advanced sharply, business that is not imperative has adjourned while it waits on the result of the Democratic Convention. This is natural, for everyone loves a fight and the political struggle that will be staged in New York promises to be an exciting one.

But this is not to say that it has or will impair confidence in the future, for no one really believes that the President of the United States has the power to create or destroy prosperity.

The idea that Presidential years have been unprosperous is utterly without foundation. It is abundantly disproved by history and even if the candidate nominated by the Democrats should be elected there is no reason to fear that the economic status of the country would be much affected one way or the other.

When the labor party came into power in Great Britain the conservatives prophesied disaster, but most of them now admit that Ramsay McDonald's government is one of the best that England ever had and with its fostering care business is reviving amazingly throughout the British Empire.

So it may be if the Democrats come into power. It is the fashion to affect a fear of Democratic radicalism, but the history of popular government is that when they win the radicals are generally sobered by responsibility and even granting the radicalism of the Democrats at present there is no reason to doubt that history will repeat itself.

Therefore it seems unwise to take counsel of fear in the present situation, for even in the doubtful event of La Follette's nomination on a third party ticket with the result that our next President will be chosen by the House or the Senate it is unlikely that the government of the United States will cease to function or be disorganized even temporarily.

These observations are ventured because here in New York there is noticeable some recurrence of the hysterical fear of "politics and politicians" to which American business men occasionally surrender.

As a matter of fact there is nothing alarming in sight or discoverable to the most critical observer. Money continues easy. Some call loans were made as low as 1½ per cent last week and it is a borrowers market in so far as commercial paper is concerned.

The Philadelphia Federal Reserve Bank has followed the lead of the New York Bank in reducing its rediscount rate to 3½ per cent, and the report of the Federal Reserve Board is construed by many to mean that the money market is being prepared for the flotation of a large German loan in the autumn.

If such a loan is issued its effect can hardly fail to be stimulating, for the credit so mobilized will at once pass into the channels of trade and quicken the movement of merchandise from producer to consumer.

The noticeable resurgence of public opinion in favor of a world court or some similar device for the prevention of war is another consideration that should not be ignored. Even those who are opposed to entangling alliances with Europe admit that trade will be immensely benefited and increased by any agreement that effectively unites the great powers in preserving the world's peace.

In detail the markets call for but little comment. Except for the advance in wheat already mentioned none of them shows any change of importance. The jobbing trade reflects a little improvement in some lines, but the Democratic Convention gives buyers an excuse for waiting and they are taking advantage of it.

There is some talk of a reduction of wages in a few industries, but most employers agree with the president of the American Woolen Co. who has declared himself opposed to a wage cut because it would reduce the purchasing power of the wage earners.

Political conditions abroad are normally confusing to an American and have been made more so by an assassination in Italy which threatens to unseat Mussolini, but the effect in this country and upon American business has been inappreciable. The economic renascence of Russia under the Soviet government is surprising many. The chervonitz currency is above its gold parity. Wheat, lumber and oil are being exported freely. The peasants have money to spend for the first time in years and since the first of January the Russian Textile Syndicate has bought more than 200,000 bales of cotton in the United States.

The weekly statement of the Federal Reserve System shows a further reduction of $9,000,000 in earning assets and an increase of $3,000,000 in the gold held. The reserve ratio stands at 82.1 per cent.

The stock market, though steady, has relapsed into dullness, and comparative quietude there and on the other exchanges seems indicated until the Democrats have nominated their candidate and the people come to realize as they will that the election means but little to business whichever party may triumph.

What's Doing in Industry

As nearly as reports from machinery and machine tool centers can be averaged, there seems to have been slight improvement in business during the past week. Inquiries have been plentiful. Unemployment increased, although not alarmingly.

Automobile production continues to decline and parts makers are feeling the effect. Yet preparation for 1925 models has brought about some machinery sales.

Railroads have been buying here and there, although the quantity buying anticipated for some time has not begun. If contemplated installment-plan buying works out well, business from railroads should improve very much. The roads are borrowing with greater facility.

Increase in awards made for industrial building indicates confidence in business in the near future.

The money market was featured by loans for five and six months at 3½ per cent, the lowest since February, 1917.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Chicago

Better days ahead is a strong sentiment among most of the business men of the Chicago territory. Even though business is quiet for the time being, it was expected to be so and retrenchment has been going on since last winter. Chicago, due to its being a great labor center, naturally has an unemployment problem on its hands at this time; but even with men flocking here for work, the unemployment situation is better than in other Illinois cities. During the past eighteen months many workers have moved their families to Chicago. When the upward swing in business gets under way, this city will be in a splendid position to put on all kinds of help.

Some of the automobile manufacturers have placed their special small tool orders for cutters, reamers, broaches, etc., to cover a longer production period than for some time past.

The feeling of greater security for the future among many of the railroad men of this territory is very pronounced, now that Congress has adjourned. However, since business for all the carriers has been so light, the purchasing departments do not feel justified in making capital expenditures for machine tools at this time. They know many new tools are needed and expect to get them "in the future."

The machine tool dealers have had inquiries from the technical high schools of the city for motor-driven wood-working tools and about the same number of general inquiries as for the past two months. This is also as was expected and does not stop the general feeling that business will be much better in the fall.

Detroit

Increased activity in the machinery and machine tool lines has resulted from the steps taken by automobile manufacturers preparatory to placing new models on the market.

It is the open season for 1925 cars, and some big orders are going in to the machinery companies. Stabilization of production and employment in all the larger factories on the Detroit industrial area are revealed in reports from various companies. During the past two weeks a number of plants increased operations in certain of their departments in anticipation of a revival of sales during the late summer and early fall months. This condition is particularly true of the automotive and accessory plants.

One of the leaders in the machine tool industry has garnered two large orders during the past week totaling up in the six figures by a wide margin. He is not the only one getting business in this territory.

Ford is maintaining a five-day schedule with no complete layoffs, while the Fisher Body Corp., the Ternstedt Manufacturing Co., the Briggs Manufacturing Co., the American Motor Body Co., and the Cadillac Motor Car Co. have all added to their payrolls.

As a further evidence of the prosperity of Detroit Charles T. Kingston, formerly with the John Brennan Boiler Co. of this city, is organizing the Great Lakes Drop Forge Co. which will operate on a three-acre site in Ecorse. The shop will have four 2,000-lb. and two 1,000-lb. hammers. The field for this company is indicated by the fact that since the Jefferson forge plant went out of business there are only two drop forge shops left in Detroit with any capacity. Detroit consumers of drop forgings can get only five per cent of their requirements locally.

Freight movements are on the upgrade, reports show, while building operations show such increases over preceding years that Detroit now ranks as third city in the country for 1924.

Philadelphia

Business in all lines of machinery sales and production continued dull throughout the Philadelphia industrial centers during the last few weeks. A part of this condition is attributed to the general industrial situation and part to the midsummer slump, now being felt in all commercial and mercantile lines.

Among the machinery dealers some inquiries have been received indicating a revival of business in the fall. Used machinery dealers report a rather brisk demand for gear shapers, and in some industries purchasers are in the field for power transmission equipment. Novelty manufacturers are in the field for this line.

There is some demand for transmission machinery from the machine shop trade. In the textile industry the demand for all equipment is virtually nil, dealers say. Some of the textile mills are shut down entirely, while others are operating at about one-third capacity. Some rather large manufacturers have made inquiry concerning power equipment, purchases to be made in the fall.

Business men generally look to the future with more confidence than they had a year ago. Although they were enjoying greater volume of trade then than now, industry is on a firmer basis. The bonus question is settled and the tax reduction program no longer is in the realm of speculation. While neither problem was settled to the liking of the average business man, they point to the fact that everyone now knows what to expect, instead of being continually on the anxious seat.

South American markets are in a position to absorb American-made machinery, according to Lew B. Clarke, United States Trade Commissioner at Buenos Aires. Mr. Clarke visited Philadelphia and was in communication with business men. One indication that Americans have taken advantage of trade opportunities in South America is that 95 per cent of the automobiles now in use in the Argentine are American built, whereas before the war the American machines were greatly in the minority.

Cincinnati

The machine tool market in Cincinnati has been rather quiet during the past two weeks. While there have been some good sales made by individual concerns, the market taken as a whole is spotty and indications point to a continuation of this condition in the immediate future. Executives state that inquiries lately have remained on about the same level as during the entire two months' period just past with only slight variations noticeable. The approach of the summer season has had its effect also and a survey of the Cincinnati situation reveals that approximately forty per cent of capacity is the schedule on which most of the plants are operating. Automobile accessory manufacturers are not as active as they were several months ago and consequently they are not buying as much machinery as they did.

There has been buying of machinery by railroads in the past two weeks. Reports of large companies indicate that several roads are about ready to close on lists that they have had out for some time. Railroad purchases in general, however, have been a disappointment. Railroads have held off in making their purchases until absolute necessity demanded action in placing orders.

So far as the automobile industry is concerned, business from this source likewise has fallen off in the past month. Indications are that this market will receive fairly good business from the automotive industry in the next month.

Foundries continue to operate on a limited basis. Foundries turning out stove and furnace castings appear to be doing a fair volume of business. The demand for pig iron is only fair.

There have been several excellent orders placed for lathes with local machine tool plants in the past couple of weeks. Inquiries for lathes have been fairly brisk while the demand for planers has been fair, according to the

statement of executives. Electrical tool manufacturers have experienced a good volume of business. Woodworking machinery and conveying machinery houses report that orders have been good. Tobacco machinery concerns have been getting some nice orders lately.

Figures that have just been made public show that there is an abundance of both skilled and unskilled laborers available. Unemployment has increased during the early part of June. This is due to the fact that many industrial manufacturers have curtailed their production to conform to the slowing down in the placing of orders.

New York

The condition prevailing in the New York district in the machinery and machine tool market during the past week has changed very little from that of the previous week. Quietness has been the general tone. Buying and selling are on a purely maintenance basis. There were some inquiries from private concerns for small supplies, materials and equipment.

Dealers in used machinery showed a tendency toward buying, which is a continuation of the activity noticeable throughout the first half of the year.

The railroads and large concerns made very few purchases. The week was marked by a few or no inquiries coming from either. It is maintained, however, that the purchases made for the week were better than those of the week preceding.

The past week marked a gain in money value of awards made for industrial building over the previous week in the United States. The totals for these weeks are $1,584,000 and $1,417,000 respectively. The minimum costs upon which these amounts are based is an industrial building of $40,000 and over. This gain reflects in general a feeling of confidence in the future of business for the last half of the present year. The sections where gains took place are New England and the Middle Atlantic States.

Cleveland

Expectation of the machinery trade for improved actual demand for new equipment has not yet been realized, though activity on the part of both distributor and consumer would seem to prove that there is still a chance for summer to develop some real business. This activity is based almost entirely upon inquiry, rather than upon actual orders placed.

The bulk of new business, leaders in the machine tool trade admit, must depend upon a return to greater activity in general manufacturing and the automotive trade. There is nothing to indicate immediate improvement. Not a few manufacturing establishments are curtailed in their output.

The machine tool industry, however, is confident that the turning point as regards used machinery has been reached and that in this connection, with the final elimination of the used machinery factor, entire attention may be devoted to replacement with new tools and the introduction of equipment into entirely new plants.

Frank Bunker Gilbreth

Frank B. Gilbreth, whose sudden death at Montclair, N. J., on June 14 was announced in the last issue of the *American Machinist*, was born at Fairfield, Maine, July 7, 1868. He was the son of John Hiram and Martha Bunker Gilbreth. His education terminated in 1885 with his graduation from the Boston English High School. Instead of going on to Massachusetts Institute of Technology he took a job with the contracting firm of a relative and started in to learn the different building trades. His early discovery that the bricklayers with whom he worked had three different sets of motions, one set for slow work, one for fast work and a third for teaching, and that the motions of each man were different from those of every other man, started him on the investigation and analysis of motions which occupied much of his time for the rest of his life.

FRANK B. GILBRETH

Mr. Gilbreth rose rapidly in the contracting industry and at one time had 10,000 men in his employ. He was engaged in this field from 1895 until 1904 in Boston and from 1904 until 1911 in New York. In 1904 he married Lillian Evelyn Moller.

In 1911 the calls for consultation became so numerous that Mr. Gilbreth gave up his contracting work and devoted his entire time to consulting engineering in the management field.

On the entrance of the United States into the World War he was commissioned a major in the Corps of Engineers and assigned to the General Staff College where he did valuable work in organizing and training. Later he made an extended trip to Europe. A complete breakdown followed and his heart suffered a strain from which it never quite recovered.

Mr. Gilbreth was the author of Field System, 1908; Concrete System, 1908; Bricklaying System, 1909; Motion Study, 1911; Primer of Scientific Management, 1911; and joint author, with his wife, of Time Study, 1916; Fatigue Study, 1916; Applied Motion Study, 1917; Motion Study for the Handicapped, 1919. He also wrote many papers for professional societies and was a lecturer at twenty colleges and universities.

He was a member of the American Society of Mechanical Engineers, the Society of Industrial Engineers, the Providence Engineering Society, the Eastern N. Y. Engineering Society, American Museum of Natural History, Academy of Political and Social Science, Franklin Inst., Society for the Promotion of Engineering Education, American Association for the Advancement of Science, and others. He organized the Society for the Promotion of the Science of Management which afterwards became the Taylor Society. In the management field he is best known for the invention of the micro-motion and chronocyclegraph processes for determining fundamental units and methods of industrial education.

Mr. Gilbreth's work was perhaps better known abroad than in this country. Some of his largest clients were in Europe. He was greatly interested in the growth of the new Czecho-Slovak Republic and gave much of his time and enthusiasm to the promotion of its interests. In return he was awarded membership in the Masaryk Academy of Work, the highest professional honor attainable.

His work will be carried on by Mrs. Gilbreth who has been his business partner for twenty years and is familiar with every detail.

H. M. Swetland, Noted Business Publisher, Dies

H. M. Swetland, president of the United Publishers Corp., which publishes *Iron Age*, *Dry Goods Economist*, *Automotive Industries* and other important business publications, died at his home in Upper Montclair, June 15. He was one of the pioneers of modern industrial publishing and had been a leader in raising journalistic standards through his activities in the Associated Business Papers. At one time he was owner of *Power* and of *Engineering & Mining Journal* (as it was then called), both now owned by the McGraw-Hill Company.

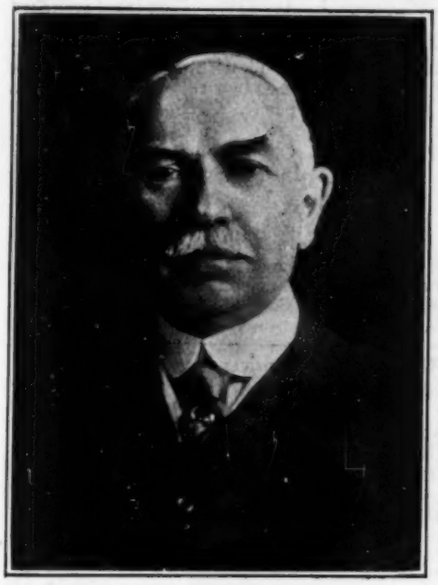
Mr. Swetland was born in Chautauqua County, New York, in 1853. In 1880 he came to New York as reporter and as subscription and advertising salesman of the *Boston Journal of Commerce*. In 1884 he became Boston representative of *Power*, later coming to New York and assuming the management of that publication. In this capacity he was associated with James H. McGraw, now president of the McGraw-Hill Co., and Emerson P. Harris. The association was discontinued in 1888 when Mr. Swetland purchased *Power*, the ownership of which he retained until he sold it to the late John A. Hill in 1900.

For many years thereafter Mr. Swetland gave his chief attention to the publication of the magazines serving the automotive industry. In 1911 he organized the United Publishers Corp., which brought together publications in

the steel, automotive, building and textile fields. He was elected president of that corporation and retained that office to the time of his death. He was also president of the National Publishers Association, the Class Journal Co., the Federal Printing Co., the U.P.C. Realty Co., and the Swetland Realty Co., and a director of the Commercial Trust Company.

Mr. Swetland's work and contribution to industrial publishing are well set forth in the following tribute paid to him by his life-long friend and former associate, Mr. McGraw:

"Mr. Swetland's success as a man and a publisher was due to a rare com-



H. M. SWETLAND

bination of personal qualities and business acumen. He was a tireless worker, had great penetration, concentration, and perseverance. He was an organizer of the first rank, and was always a co-operator. His ideals in publishing were high, service to the readers of his publications being his first consideration. The publishing business has lost an outstanding figure in the passing of Horace M. Swetland, but his work will endure in the great institutions to which he gave unstinted devotion, and in the lives of those whom he trained in the technique of publishing and encouraged to make the best of their opportunities."

Mr. Swetland not alone won for himself marked distinction in American technical journalism and in those industries which his papers served, but—what he prized more—the high regard and respect of all his very wide circle of associates, business and social. To these, his passing brings a keen regret.

FRANK B. MALONEY, general superintendent of the Union Drawn Steel Co., Beaver Falls, Pa., died at his country home, Darlington, Pa., on June 9. He was 63 years old and had been with the Union Drawn Steel Co., for 33 years.

HENRY HAVELOCK DICKSON, president of the Dickson Car Wheel Co., Houston, Texas, died on May 16.

Personals

G. M. WILLIAMS, formerly general manager of the Dayton-Wright Aeroplane Co., Dayton, Ohio, has been chosen president of the Nordyke & Marmon Co., Indianapolis, Ind.

GUY E. TRIPP, Chairman of the Board, Westinghouse Electric & Mfg. Co., was given honorary degree of Doctor of Laws by Bates College on June 18.

K. T. KELLER, formerly manager of production, Chevrolet Motor Co., who some time ago was made general manager of General Motors of Canada, has been appointed vice-president, reporting to R. S. McLaughlin, president.

AMBROSE SWASEY was awarded the degree of Doctor of Science by the University of Pennsylvania at its commencement exercises last week.

HOWARD BIRD, for several years general manager of the Canadian Pneumatic Co., a subsidiary of the Chicago Pneumatic Tool Co., has been made managing director of the Consolidated Pneumatic Tool Co., another subsidiary, and director of European sales of the Chicago Pneumatic Tool Co., with headquarters in London, to succeed the late H. D. Megary. D. M. WESBROOK has been transferred from the position of district sales manager of the Minneapolis branch to the position of general manager of the Canadian Pneumatic Tool Co. to succeed Mr. Bird.

G. W. MCLAUGHLIN, vice-president and general sales manager of General Motors of Canada, has retired after 38 years of service. J. H. DEATON has been appointed general sales manager and C. E. MCTAVISH general parts and service manager.

J. C. MERWIN, works manager of the Chain Belt Co., Milwaukee, was elected second vice-president at the annual meeting of the company held in Milwaukee this month. BRINTON WELSER was elected secretary and C. E. STONE asistant secretary. The officers re-elected were C. R. MESSINGER, president; CLIFFORD F. MESSINGER, first vice-president; C. L. PFEIFER, treasurer.

ROBERT HARBISON BOOTH, assistant to the president of the Bridgeport Brass Co., Bridgeport, Conn., has become general manager of Whitney-MacDonald, Inc., of Philadelphia.

Business Items

The Hendey Machine Co., Torrington, Conn., has announced that its Chicago headquarters will be moved to Suite 200-3 Sharples Building, corner of W. Washington Blvd. and Jefferson St. on July first.

The Lakeside Steel Improvement Co., recently organized, has purchased the plant, equipment and heat-treating business of the Steel Improvement and Forge Co., 5418 Lakeside Avenue, Cleveland, Ohio.

The San Francisco branch office and warehouse of S. F. Bowser & Co. will be moved at once into the two-story building just completed. The new building provides 20,000 ft. of floor space. Instead of shipping assembled products to the Pacific coast, parts will be shipped assembled there. The San Francisco branch has supervision of sales on the west coast and Hawaiian Islands.

The Muncie Products Co., Muncie, Ind., a division of the General Motors Corp., announced recently that more than 200 employees had been returned to work.

Rumors to the effect that the Indiana Brass Co., of Frankfort, Ind., is to be closed down are denied. Officials declare that prospects are brighter than they have been for some months.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Machine tools, especially gear cutting machines. Purchase. Reference No. 10,572.

Machine tools, especially for the shipbuilding industry. Purchase and Agency. Reference No. 10,566.

Lathes, drills, and small tools. Purchase and Agency. Reference No. 10,566.

Machinery for making steel table and other knives. Purchase. Reference No. 10,570.

Welding and cutting apparatus, oxyacetylene and electric. Purchase and Agency. Reference No. 10,566.

Woodworking machinery. Agency. Reference No. 10,544.

A cold storage company in South Africa is sending an official to the United States for equipment and machinery for the manufacture of ice cream. American manufacturers of this type of machinery may get in touch with him upon his arrival through the New York district office of the Bureau of Foreign and Domestic Commerce, 730 Customhouse.

Heinrich Schubert & Co., Artillerie-Strasse 36a, Berlin N. 24, Germany, would like to represent American manufacturers of machine tools and small tools, transmission machinery, belting and abrasive wheels.

Forthcoming Meetings

American Society for Testing Materials. Twenty-seventh annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. Week of June 23. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. Summer Meeting. June 24, 25, 26 and 27. Spring Lake, N. J. C. F. Clarkson, secretary, 29 W. 39th St., New York City.

American Society for Steel Treating. Sixth Convention, Boston, Mass., Sept. 22, 23, 24, 25 and 26. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Foundrymen's Association. Twenty-eighth annual convention. Milwaukee, Wis. Week of Oct. 13, 1924.

National Industrial Advertisers Association. Annual meeting, Edgewater Beach Hotel, Chicago, beginning October 13, 1924.

Management Week. Under the auspices of the American Society of Mechanical Engineers. Week of Oct. 20, 1924. New York City.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Small-lot buying characterizes the current pig-iron market. Present quotations on No. 2 foundry iron are $20 to $21 per ton, f.o.b. Birmingham, against an average rate of $21 per ton one week ago. There have been no signs of change in mill prices of tool steel or the heavy rolled products during the past week. Bars are now $2.20 @2.25; shapes, $2.10@$2.25 and plates, $2@$2.20 per 100 lb. Pittsburgh.

Non-Ferrous Metals—Present price of tin about ½c. per lb. higher than on June 13, at New York warehouses. Downward trend in both tin and antimony reported in foreign markets. Electrolytic copper quoted at 13c.; current price but slightly above level of Aug. 25, 1921, at which time quotations ranged from 12¾c. to 13c. per lb. at New York warehouses. Lead down ¼c. per lb. during week; zinc market easier but with prices unchanged.

Red and White Lead—Price down ½c. per lb., f.o.b., New York in 100 lb. lots, effective June 19. This reduction applies to both dry and in oil and represents the first change since Feb. 28, 1924.

(All prices as of June 20)

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.05
Northern Basic	24.00
Southern Ohio No. 2	24.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.00
BIRMINGHAM	
No. 2 Foundry	20@21
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.25
Virginia No. 2	28.17
Basic	24.00
Grey Forge	24.00
CHICAGO	
No. 2 Foundry local	24.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	27.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.77
Basic	25.77
Bessemer	26.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh	New York	Cleveland	Chicago
No. 10	$2.80@3.00	4.14	3.65	4.00
No. 12	2.90@3.10	4.19	3.70	4.05
No. 14	3.00@3.20	4.24	3.75	4.10
No. 16	3.20@3.40	4.34	3.85	4.20
Black				
Nos. 17 and 21	3.60@3.70	4.55	4.35	4.55
Nos. 22 and 24	3.65@3.75	4.60	4.40	4.55
Nos. 25 and 26	3.70@3.80	4.65	4.45	4.60
No. 28	3.75@3.85	4.75	4.55	4.70
Galvanized				
Nos. 10 and 11	3.75@4.00	4.80	....	4.60
Nos. 12 and 14	3.85@5.10	4.90	....	4.70
Nos. 17 and 21	4.15@4.40	5.20	....	5.00
Nos. 22 and 24	4.30@4.55	5.35	5.10	5.15
No. 26	4.45@4.70	5.45	5.35	5.30
No. 28	4.75@5.00	5.75	5.65	5.60

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ⅛-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
⅛	$0.09	50%	⅞	$0.16	35%
¼	.11	45%	1	.18	31%
⅜	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.70
Hoop steel	4.59	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.40
Floor plates	5.80	5.66	5.80
Cold drawn shafting or screw	4.40	4.10	4.00
Cold drawn flats, squares	4.90	4.60	4.50
Structural shapes (base)	3.44	3.46	3.30
Soft steel bars (base)	3.34	3.36	3.20
Soft steel bar shapes (base)	3.34	3.36	3.20
Soft steel bands (base)	4.09	3.61	3.95
Tank plates (base)	3.44	3.46	3.30
Bar iron (3.00 at mill)	3.49	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	60%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ⅛, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.00
Tin, 5-ton lots, New York			43.75
Lead (up to carlots), St. Louis	6.95	New York	7.62½
Zinc (up to carlots), St. Louis	5.75	New York	6.50

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	27.00	28.00	28.50
Antimony (Chinese), ton spot	9.00	10.50	10.00
Copper sheets, base	20.25	20.25@20.50	23.00
Copper wire, base	15.50	18.25	16.25
Copper bars, base	19.25	21.50	19.50
Copper tubing, base	22.25	26.50	23.00
Brass sheets, base	16.75	21.00	18.75
Brass tubing, base	21.00	26.00	20.50
Brass rods, base	14.50	17.00	15.75
Brass wire, base	17.25	21.00	....
Zinc sheets (casks)	10.50	10.75	....
Solder (½ and ¼), (case lots)	33.50	30.00	30.00
Babbitt metal (83% tin)	60.00	55.00	48@52
Babbitt metal (35% tin)	28.00	17.50	23@26
Nickel (ingot and shot) f.o.b. refinery	27.00	....	....
Nickel (electrolytic) f.o.b. refinery	30.00	....	35.00
Nickel (F shot) f.o.b. refinery	30.00	....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b Huntington, W. Va.:

Rolled nickel sheet (base)	52.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Shop Materials and Supplies

METALS—Continued

Manganese nickel hot rolled rods "E"—low manganese (base) 54.00
Manganese nickel hot rolled rods "D"—high manganese (base) 57.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00@10.75	10.00	10.75
Copper, heavy, and wire	9.62½@10.50	9.50	10.00
Copper, light, and bottoms	8.50@9.00	8.00	9.00
Lead, heavy	5.62½@6.00	5.00	6.50
Lead, tea	4.37½@5.00	3.00	5.50
Brass, heavy, yellow	6.50		6.50
Brass, heavy, red	8.50 @8.75	8.50	8.50
Brass, light	5.75	4.50	6.00
No. 1 yellow brass turnings	6.50 @6.75	5.50	6.50
Zinc	3.50 @3.75	3.50	3.50

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$24.30	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	20.20	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.14@0.21	$0.20	$0.14
Cotton waste, colored, per lb.	.09@.12½	.17	.10½
Wiping cloths, 13¼x13¼, per lb	10.75*	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.98	1.09	.94
Lard cutting oil, 25% lard, per gal.	.55	.50	.79†
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	.35	.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–2½%	30–10%	30–10%
Heavy grade	30–5%	30%	20–5–2½%
Rubber transmission:			
First grade	50%	50–10%	40–10%
Second grade	50–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.40	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		3.25@3.50
Coke, prompt foundry, Connellsville	per net ton		4.50@5.00
White lead, dry or in oil	100 lb. kegs		New York, 14.50
Red lead, dry	100 lb. kegs		New York, 14.50
Red lead, in oil	100 lb. kegs		New York, 16.00

*White, at washery.
†Chicago quotes on pure lard oil, No. 1 grade.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0349	$0.0349	$0.0354
Cold finished shafting	per lb.	0.044	0.044	0.044
Brass rods	per lb	0.145	0.145	0.1875
Solder (½ and ½)	per lb.	0.335	0.3475	0.315
Cotton waste	per lb.	.14@.21	.14@.21	.10@.13
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.38
Lard cutting oil	per gal.	0.55	0.55	0.65
Machine oil	per gal.	0.29	0.29	0.297
Belting, leather, medium	off list	40–2½%	40–2½%	30–10%
Machine bolts up to 1x30 in.	off list	50%	50%	30%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	50%	60–10–5%	55–5%
1½ and 1½x3 in. up to 12 in.	15%	60%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	40%	$3.50 net	.....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	10%	List net	3.50
Hex. head and hex. nut bolts	10%	.....List plus 10%	
Lag screws, coach screws	50%	.....	50-5%
Square and hex. head cap screws	75%	75%	75–5%
Carriage bolts, up to 1 in.x30 in.	40%	60%	50–5%
Bolt ends, with hot pressed nuts	50%	.....	55-5%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅜ and smaller	70%	.....	.....
Semi-finished nuts, ½ and larger	65%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$4.00
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	4.00
Washers, round plate, per 100 lb. Off list	1.50	4.50	4.00
Nuts, hot pressed, sq., per 100 lb. Off list	1.50	4.00	3.50
Nuts, hot pressed, hex., per 100 lb. Off list	1.50	4.00	3.50
Nuts, cold punched, sq., per 100 lb. Off list	1.50	4.00	3.50
Nuts, cold punched, hex., per 100 lb. Off list	1.50	4.00	3.50
Rivets:			
Rivets, ⅞ in. dia. and smaller	50%	60–10%	60%
Rivets, tinned	50%	60–10%	4½c. net
Button heads ⅝-in., ¾-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.50	$3.75
Cone heads, ditto (net)	5.20	3.60	3.95
1½ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.35	.....	0.15
½ in. diameter *EXTRA*	0.75	.....	0.50
1 in. long, and shorter *EXTRA*	0.75	.....	0.50
Longer than 5 in. *EXTRA*	0.50	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.45	.....	$4.20 base

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Calif., San Francisco—J. A. Roebling & Sons Co. (manufacturer of wire and wire rope), 646 Folsom St.—stranding machinery.

D. C., Wash. — United States Veterans Bureau, Arlington Bldg.—receiving bids until July 3 for bandsaw and speed lathe.

Ky., Louisville—Office of United States Engineer, P. O. Box 72—wood-boring machine.

Mass., Boston—H. F. Livermore Co., 100 Cummington St.—machine shop equipment.

N. Y., Buffalo—Buffalo Sintering Corp., Foot of Marilla St.—conveyors, ovens and heavy machinery for reclaiming ore.

N. Y., New York—The Allied American Corp., 165 Broadway, c/o D. L. Saxon—screw and nut making machines for making machine screws with rolled thread, wood screws, rivets, nuts and rolled thread bolts. Preferably in sextuplicate.

O., Cleveland—City, c/o A. K. Hoare, City Hall, 6 in. pipe machine, 36 in. radial drill, 30 in. engine lathe, 24 in. shaper with various tool equipment, and 2 ton monorail with 2 ton capacity hoist.

O., Columbus—Columbus Conveyor Co., West Goodale St. (manufacturer of conveying equipment), S. T. Isaac, Pres. — medium size drill press and 24 in. lathe.

O., Columbus—Powell Lumber & Constr. Co., 81 North Nelson St., F. E. Powell, Pres. — molding machine and sander for planing mill.

Pa., Blossburg—J. P. Ward Foundry—J. E. Willis, Purch. Agt., foundry equipment for the manufacture of pipe fittings.

Vt., Bennington—A. S. Payne (brush factory) — two double spindle wood shaping machines for small pieces birch wood, motor driven.

Wis., Glidden—Pfiffner Saw Mill Co.—band saw mill rip saws.

Wis., Milwaukee—J. Eckert, 701 56th St. (woodworking)—3 to 4 in. sticker.

Wis., Milwaukee—J. H. Weber Hardware Co., 2709 Fond du Lac Ave.—cornice break shears.

Wis., Milwaukee—Standard Sanitary Mfg. Co., 311 5th St.—special machinery and enameling equipment.

Ont., Milverton—Hondelick Bros.—complete equipment for furniture factory, to replace fire loss.

Opportunities for Future Business

Calif., Los Angeles—Neptune Meter Co.—awarded the contract for the construction of a 3 story, 117 x 135 ft. warehouse and shops. Cost about $100,000.

Calif., San Francisco—The Buckley Door Co., Quint and Evans Aves., awarded the contract for the construction of a 1 story factory for the manufacture of window and door frames, etc. Estimated cost $42,000.

Ind., Richmond—F. and N. Lawn Mower Co. are receiving bids for the construction of a 4 story, 75 x 100 ft. lawn mower factory. Estimated cost $100,000. J. Mueller & Co., Palladium Bldg., Archts. Noted June 19.

Ind., South Bend—The De Rhodes Motor Co. awarded the contract for the construction of a 3 story, 66 x 166 ft. garage on North Lafayette St. Estimated cost $175,000.

Mass., Allston (Boston P. O.)—The H. F. Livermore Co., 100 Cummington St., Boston, will build a 2 story, 75 x 245 ft. machine shop, here. Estimated cost $120,000.

Mass., Boston—The Kohler Co., (enameled ware) 427 Commercial St., awarded the contract for the construction of a 5 story factory and warehouse at 445 C St., South Boston. Estimated cost $125,000.

Mass., Boston—The Reardon Bldg. Trust, 3168 Washington St., Jamaica Plain (Boston P. O.), awarded the contract for the construction of a 1 story, 70 x 150 ft. service station and garage on Columbus Ave., here. Estimated cost $150,000.

Mass., Jamaica Plain (Boston P. O.)—Reardon Bldg. Trust, 3168 Washington St., awarded the contract for the construction of a 1 story 60 x 150 ft. service station and repair shop. Estimated cost $50,000.

Mass., Somerville — The International Harvester Co. of America, 43 Somerville Ave., awarded the contract for the construction of a 1 story 75 x 100 ft. service station. Estimated cost 40,000. Noted May 8.

Dear Reader:

If you don't get the order when you follow up the sales leads on this page it may be because of competition by others using the same leads. Concerning one item, a manufacturer wrote us as follows:

"....We have certainly been flooded with inquiries and salesmen calling."

The reason for this is the reliability of the American Machinist. Our reporters all over the country are instructed to verify every report before sending it in.

Yours for service,

BUSINESS NEWS DEPARTMENT,
McGRAW-HILL CO., INC.,
10th Ave. at 36th St., New York.

Mass., Springfield—Westinghouse Elec. & Mfg. Co., 82 Washington St., awarded the contract for the construction of a 1 story, 110 x 160 ft. addition to punch press dept. Cost to exceed $40,000.

Mass., Templeton—The Travers Mfg. Co., (children's carriages) are having plans prepared for the construction of a factory. Private plans. Estimated cost $100,000.

Minn., Duluth—G. & W. Refrigerator Co., F. Geisler, Pres., Cloquet, will receive bids until July 10th for the construction of a 2 story, 100 x 140 ft. refrigerator factory. Engineering Dept. of Cloquet Lumber Co., Engrs. and Archts. Estimated cost 100,000.

Mo., St. Louis—The Terminal Railroad Assn., 1800 Market St., awarded the contract for the construction of a 2 story, 28 x 49 x 81 ft. railroad service building at 3200 Scott St. Estimated cost $40,000.

N. Y., Buffalo—Buffalo Sintering Corp., Foot of Marilla St., has awarded contract for construction of a sintering plant. Cost to exceed $100,000.

N. Y., Chateaugay—The Chateaugay Ore & Iron Co. plans to rebuild its 5 story magnetic iron ore separator, recently destroyed by fire. Estimated cost $300,000. J. R. Linney, Mgr.

O., Cincinnati—The Davis Welding Co., 1110 Richmond St., manufacturer of steel tanks, awarded the contract for the construction of a 1 story addition to its welding shop on Llewellyn St. Estimated cost $95,000. Noted Feb. 21.

Ohio, Cleveland—Fixit Body & Fender Co., 2075 East 65th St., awarded the contract for the construction of a 2 story, addition to its factory. Estimated cost $50,000. Noted Mar. 6.

O., Cleveland—The W. S. Tyler Co., 3615 Superior Ave., manufacturer of ornamental iron and bronze work, awarded the contract for the construction of a 2 story, 110 x 115 ft. factory on East 36th St. Estimated cost $200,000. C. Zimmerman, Secy. Noted June 19.

Pa., Bryn Mawr—Le Boutillier & Dolan, Lane & Lee Aves., awarded the contract for the construction of a 1 story, 84 x 50 ft. auto repair shop. Estimated cost $18,000.

Pa., Johnstown—The Mitchell Spring & Mfg. Co. will build a 1 story, 100 x 100 ft. factory. Estimated cost $40,000.

Pa., Phila.—Phila. Insulated Wire Co., 200 North 3rd St., awarded the contract for the construction of a 5 story, 14 x 20 x 150 ft., addition to plant on 3rd and Florist Sts. Estimated cost $50,000.

Wis., Milwaukee — The Display Fixture Mfg. Co., 1627 St. Paul Ave., awarded the contract for the construction of a 1 story, 52 x 120 ft. factory. Estimated cost $40,000.

Wis., Milwaukee—The Oilgear Co., 398 38th St., manufacturer of hydraulic broaching machines, awarded the contract for the construction of a 1 story, 90 x 171 ft. machine and assembling shop at 701 Park St. E. K. Swigert, Pres.

Wis., Milwaukee—Standard Sanitary Mfg. Co., 311 5th St., had plans prepared for the construction of a 5 story, 82 x 175 ft. plant, on 17th St. Estimated cost, $250,000. Hunting-Davis Co., 1150 Century Bldg., Pittsburgh, archts.

Wis., Racine—Belle City Malleable Iron Co., Kewaunee St., has awarded the contract for the construction of a 1 story 80 x 135 ft., addition to factory. Estimated cost, $45,000.

Wis., Shorewood (Milwaukee P .O.)—School Dist. 4, H. Kuechenmeister, Clk., is having preliminary plans prepared for the construction of a 1 or 2 story manual training shop on Atwater St. Estimated cost $45,000. Herbst & Kuenzli, 130 Grand Ave., Milwaukee, Archts.

Wis., Two Rivers—The Hamilton Mfg. Co. (printers cabinets) awarded the contract for the construction of a 1 story, 80 x 121 ft. addition to factory. Estimated cost $40,000.

Wis., West Allis—Allis Chalmers Mfg. Co., awarded the contract for the construction of a 7 story, 120 x 137 ft. pattern storage building.

Tenn., Memphis—D. Dermon & A. Jett, awarded the contract for the construction of a 2 story, 183 x 245 ft. garage and store bldg. Estimated cost $200,000. Noted Jan. 31.

Wash., Seattle—The Vance Lumber Co., Stuart Bldg., is having plans prepared for the construction of a 3 story, 115 x 420 ft. factory on Republican and Mercer Sts. Estimated cost $400,000. V. W. Voorhees, Eitel Bldg., Archt.

Que., Hull—The E. B. Eddy Co., Ltd., had plans prepared for the construction of a match factory. Estimated cost $500,000. Private plans.

Que., Valleyfield — The Walsh Plate & Structural Wks., Montreal, plans to build a steel plant, here. Estimated cost $200,000. Engineer or architect not announced.

Ont., Milverton—Hondelick Bros. plan to rebuild furniture factory, recently destroyed by fire. Estimated cost $100,000.

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American Machinist

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Visiting Other Shops

IT'S a safe bet that no real mechanic can visit another shop without getting a few ideas. Sometimes he finds methods he can adopt to advantage. Then again he discovers practices which he wants to avoid. But in any case he adds greatly to his store of knowledge and is of more value to his employer.

For many reasons, economic and otherwise, most of you cannot travel extensively and pick up new ideas for your own use. That's where the "American Machinist" comes in. It gathers them for you and puts them in such shape that you can read them, study them and file them if you wish.

Two of our editors have each traveled over 8,000 miles during the first five months of 1924 gathering new ideas from various sections of the country. Automobile shops and service stations, railroad shops and many smaller establishments have been visited and information on tools and methods has been gathered for your use!

Are you using them or do you miss some because you think you haven't time to read?

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If you must talk, talk about how rotten the weather has been, and not how poor *you* think business is going to be.

THE JOHNSON FRICTION CLUTCH

EIGHT JOHNSON CLUTCHES

Are Used On This New Sommer & Adams Co. Multiple Spindle

SPLINE HOBBING MACHINE

Single Clutch Exterior

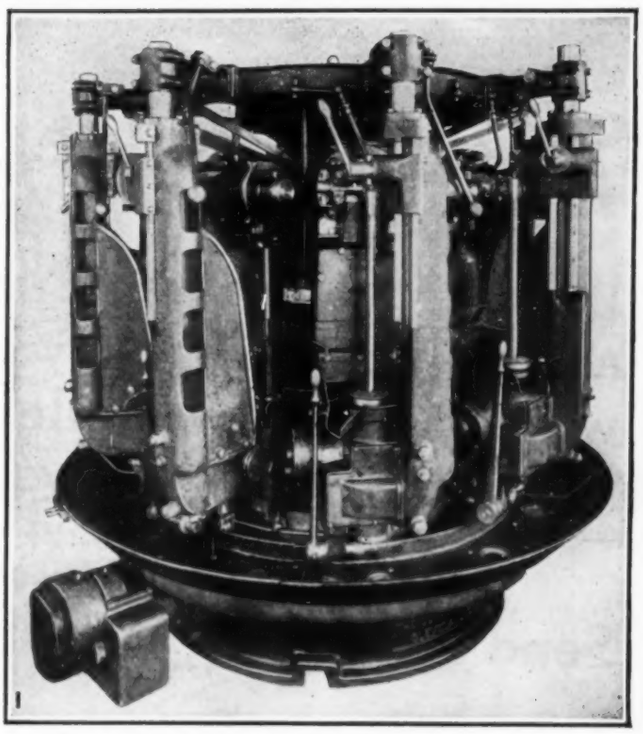
The drive for the hob spindles and work heads is obtained from a vertical shaft located at the center of the column. This shaft is driven through bevel gears from the drive shaft in the base and carries at its upper end a large bevel gear. Meshing with this gear are eight bevel pinions, running loosely on shafts which extend radially toward the hob drive mechanism. Each of the eight Carlyle Johnson No. 2 Single Clutches is operated by its individual handle to transmit the power from each pinion, and by this means each unit can be started or stopped independently.

Eight Carlyle Johnson clutches on this splendid new spline hobbing machine. That's what the Sommer & Adams Company think of the Johnson Clutch. Most of the prominent machine builders of the country think the same way. Every customer who buys this new machine can forget all about clutch problems for the next fifteen or twenty years. The sturdy, compact, durable, powerful No. 2 Johnson—eight of them —will meet every clutch requirement.

You Save Money

The Johnson Clutch cuts down the cost of power transmission and thereby saves money for you. It is very strong; it runs smoothly; it is without clatter or bang; it is a satisfactory, long-life clutch.

WRITE TODAY FOR BLUE CATALOG.



Courtesy: The Sommer & Adams Company, Cleveland, Ohio.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

Still on top!

Once more Lodge & Shipley has scored a distinct hit. The DUOMATIC has been given a rousing reception. Manufacturers have been quick to recognize a machine that embodies new and distinctive features.

For over a year now DUOMATICS have been in use around the country. They have made good! Installations in most cases have been increased. What could be a more convincing fact that the DUOMATIC is here and here to stay?

This lathe is the culmination of years of intensive thought by *specialists*. It is not marketed merely to meet the demand for an automatic lathe but to help you, Mr. Manufacturer, get more work each hour! That it can do this we have no doubt. It is doing this very thing for a good number of big manufacturers; it can do the same for YOU.

The design of this machine is along entirely new lines. Particular attention has been given to rigidity. This undoubtedly accounts for the lathe holding up so well and being able to do hogging indefinitely and yet not interfere one iota with its accuracy on close work.

A machine such as this one is worth investigating. The 16-page booklet tells the whole story.

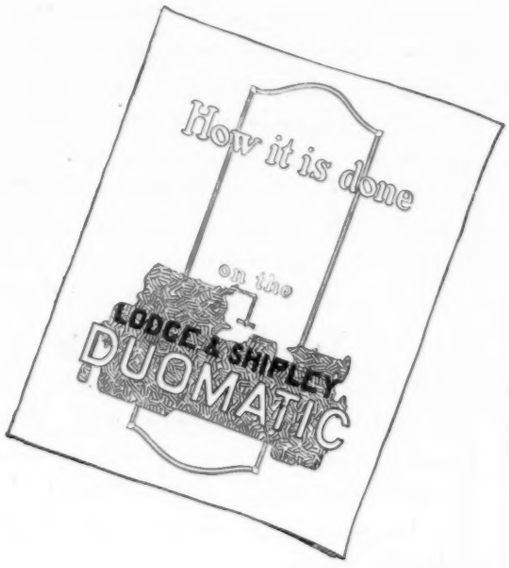
Send for booklet!

No obligation

If you are interested in automatic machinery you will want this booklet.

It tells about the lathe—
it gives examples!

Send today!



The Lodge & ShipleMa

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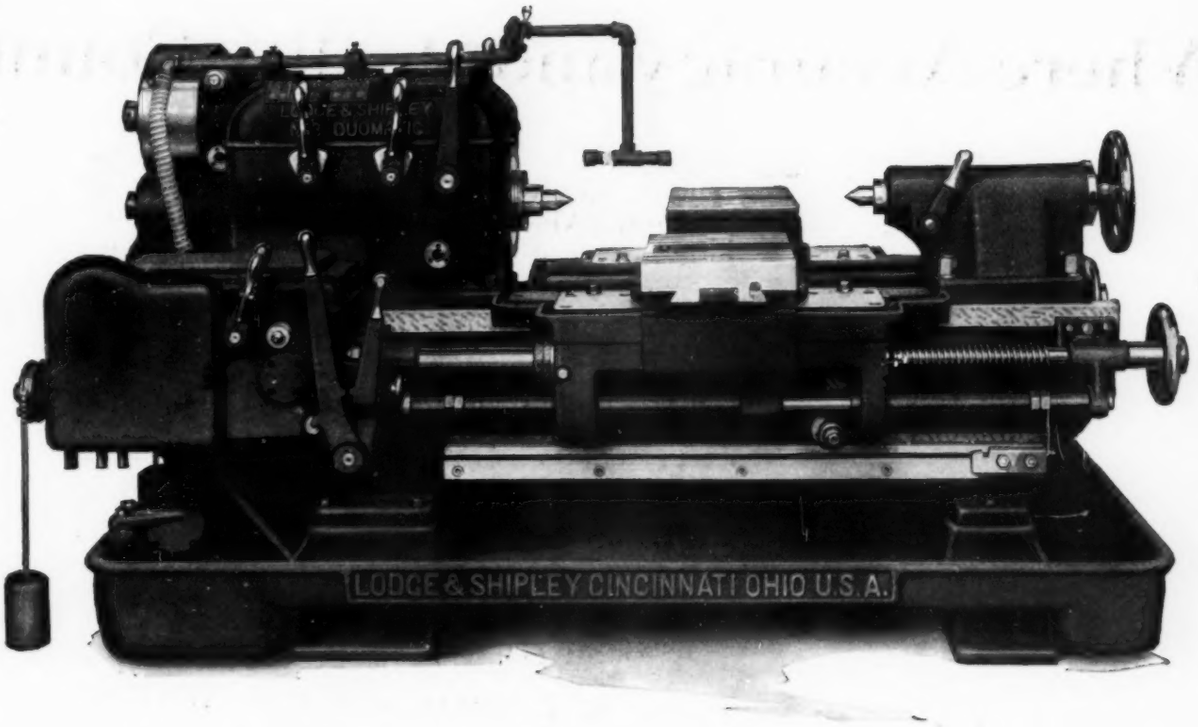
The Lodge & Shipley DUOMATIC

Patented



The Lodge & Shipley DUOMATIC Lathe

is worth while investigating. It is new. It is different. It embodies features that make it the automatic *par excellence!*

Machine Tool Co.

Ohio

No. 5

Little Stories of Service and Savings

SACO-LOWELL SHOPS Says →

Where Accuracy and Quality Count!

"Of course the accuracy of the work depends upon the care of making the various settings on the Milling Machine, *but* without a milling machine that is of the highest standard in regard to accuracy, workmanship, rigidity and ease of handling, the use of the indicator and heighth gauge would be of no value."

The paragraphs above are verbatim from a letter received from the Saco-Lowell Shops. It illustrates admirably the big principle that *it does not pay* to put time, care and accuracy into set-up, unless backed up by rigidity and accuracy in the machine.

You will be interested in the story of *Cincinnati Accuracy* as set forth in the booklet—"Tool Room Methods." Send for a copy at once.

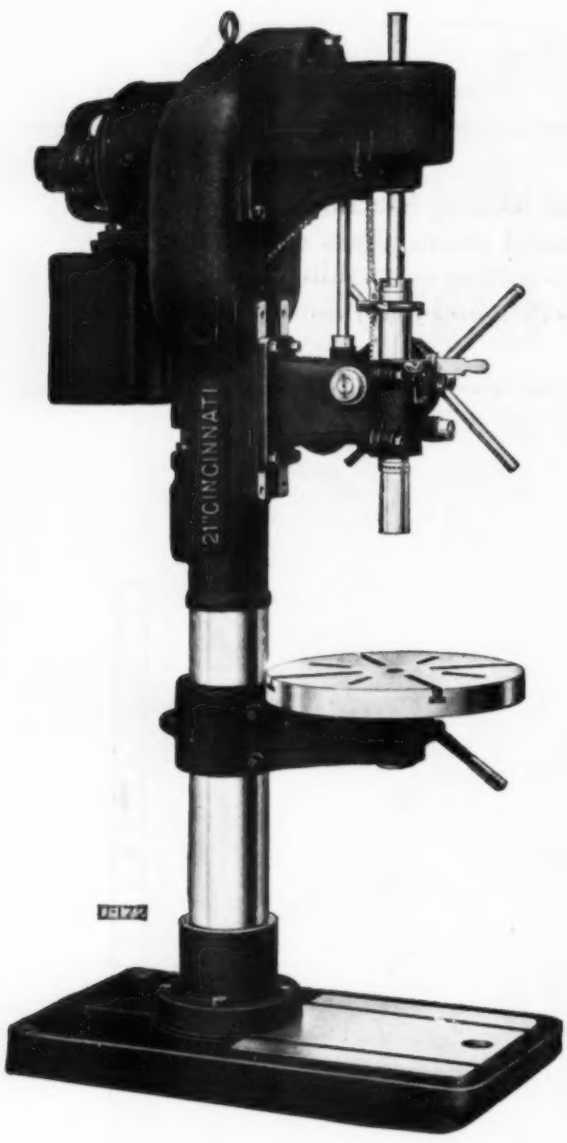
THE CINCINNATI MILLING MACHINE COMPANY
CINCINNATI, OHIO

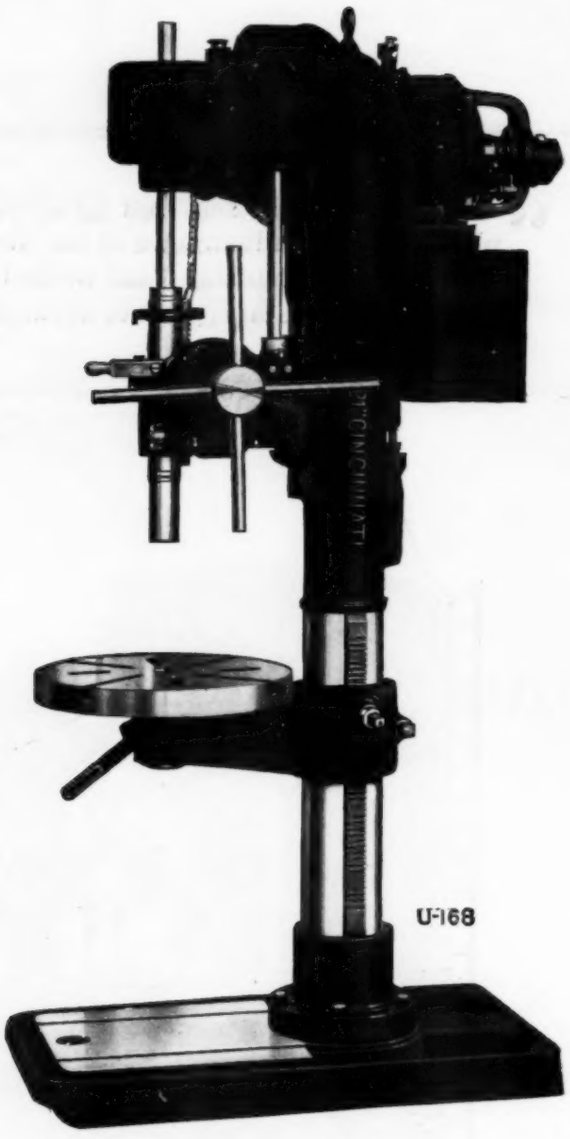
CINCINNATI MILLERS

"We appreciate the fact that all of the Cincinnati Milling Machines used at this plant have the advantages of the above mentioned points (ease of handling—rigidity—workmanship), and we feel that we are getting everything possible out of our machines in regard to *accuracy, high quality and maximum production.*"

A No. 3 Universal High Power Miller (but one of a large installation of Cincinnati Millers) in the tool room of the Saco-Lowell Shops, milling a special jig for drilling and tapping parts on cotton slasher.

CINCINNATI MILLERS





21-Inch, Direct Drive, Movable Head Upright

This machine was evolved, primarily, for the automobile shop, in which the cardinal requisites are: simplicity of design, durability of construction, and maximum production per square foot of floor space.

The spindle operates at but a single speed and feed, the general limits of which are 48 to 707 revolutions per minute and 6 to 30 thousandths per revolution.

The head may be placed in three vertical positions, the extremes of which afford a range of 5 inches.

The motor is mounted upon a bracket which is made to adjust vertically in order to obtain a correct meshing of such ratios of gears as may be required.

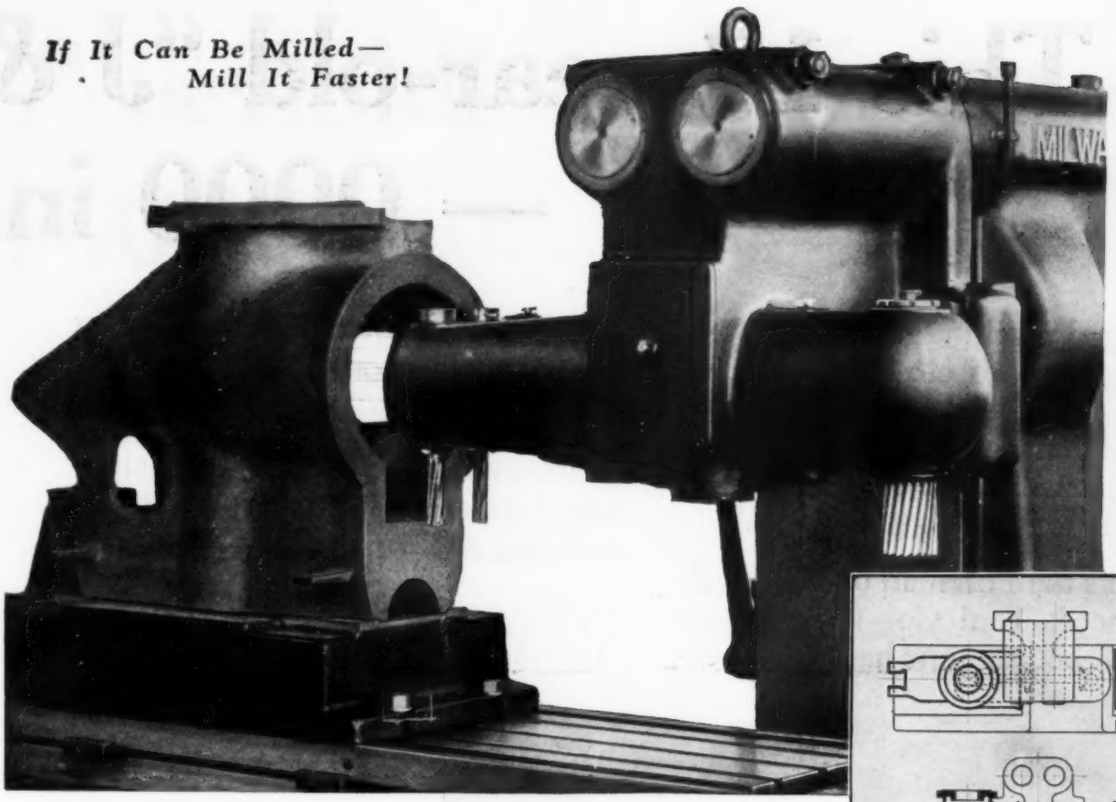
An eyelet at the top of the tool facilitates handling, while an opening in the back of the column affords access to the counterweight and chain.

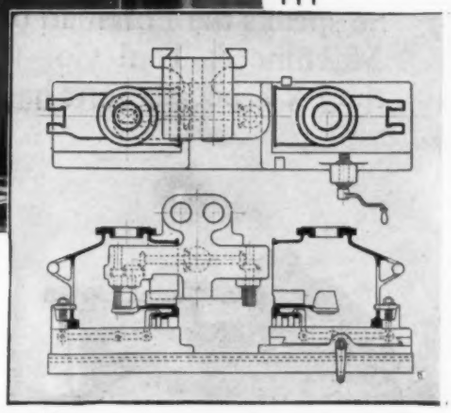
The machine may, when desired, be furnished with a hand-feed pilot-wheel; a tapping attachment, a belt drive, pump, oil grooved table, and as a two to six spindle gang drill

The Cincinnati Bickford Tool Co.

Oakley, Cincinnati, Ohio, U. S. A

If It Can Be Milled—
Mill It Faster!





Reaching Inside
for a milling job
With a K & T Layout

This Layout makes it possible to reach inside of the casting and mill five interior surfaces. The small end mills finish two internal bosses at a single pass. The large cutter on the opposite end of the attachment mills the sides and bottom of an internal slot. It passes down one side; the work is then moved over to size up the slot and the cutter returns along the opposite side. To accomplish this, the right hand fixture is provided with a cross movement, operated by a crank and traversing screw.

The fixtures carry two castings, one rough and the other partially finished. After the first operation is completed, the casting is transferred to the fixture at the opposite end of the table. Although handled twice, the loading time is reduced to a minimum, as it takes place during the milling.

Send for K & T Production Service Book and Layout Data, or without obligation, write us about the milling job on which you want to lower your costs.

KEARNEY & TRECKER
CORPORATION

Manufacturers of Milwaukee Milling Machines

Send the Coupon

Send the coupon below for our Production Service Book and additional data on K & T Layouts. Each one of them has been especially developed by our Production Service Department to meet some difficult milling problem of production or cost. They will show you how others have profited by using our Production Service and how K & T Layouts will meet your needs on large or small production.

KEARNEY & TRECKER CORPORATION
MILWAUKEE MILLING MACHINES

Kearney & Trecker Corporation
Milwaukee, Wisconsin

Please send me your Production Book and K & T Layout Data Sheets.

AM7

Name_____

Firm Name_____

Firm Address_____

This 17-year-old "J & L" Flat Turret Lathe is still holding to limits of —.0000 in., +.0005 in.

"A rugged machine for heavy work that can keep to close limits without strain on the operator. Our experience has shown that *Jones & Lamson Flat Turret Lathes* are the best tools for our class of work."

So speaks the Foreman of the Baush Machine & Tool Co. He knows the J & L because one has been operating in the Baush plant for over *17 years* and four others have a 6-year record.

Below, we show the J & L machining Universal Joint parts, holding to limits of — .0000 in., + .0005 in.

In many respects the latest J & L Flat Turret Lathe is similar to the first

Branch Office:
San Francisco, California
503 Market Street

AGENTS:

Japan, Korea, Manchuria, Formosa
Mitsui Co., Ltd., Tokio

France, Spain and Belgium—F. Auberty & Co.
182 Rue Lafayette, Paris

Australasia—McPherson, Pty., Ltd.
554 Collins St., Melbourne

JONES & LAMSON

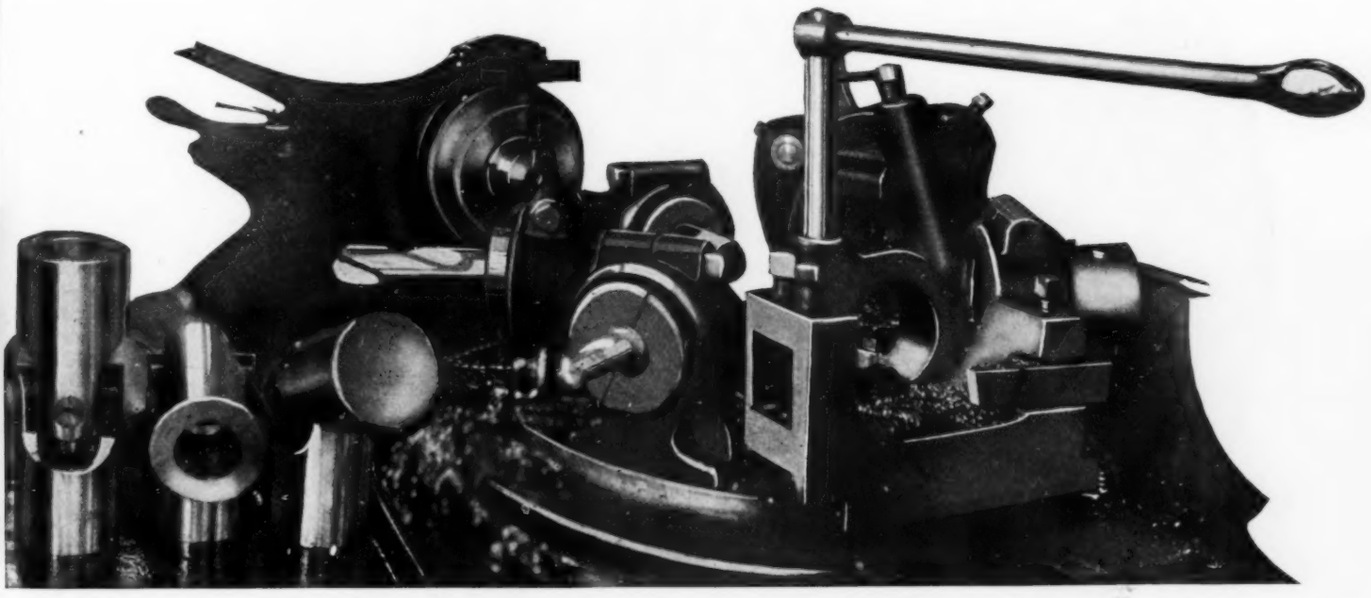
SPRINGFIELD

L" is holding to limits +.0005 in.

one built in '91. It has all those qualities which make for long and continuous service. Improvements, such as the cross sliding head, the double spindle, etc., that have been added to the original designs have greatly increased the productive capacity, the accuracy and the tool economy of the J & L until now we believe—and we have many endorsements to strengthen us in the belief —that it is the most adaptable and economical machine of its kind today.

Let us tell you about the special advantages that make the J & L Flat Turret Lathe best for your work.

Write today
for complete details



MACHINE COMPANY

VERMONT, U. S. A.

Branch Office:

London, England
9-10 Water Lane, Queen Victoria St.

AGENTS:

Holland—Spliethoff, Beeuwkes & Co.
Luevehaven, Wz., 159 Rotterdam

Sweden—A. Bol. Oscar Lindbom
Stockholm—Post Box 420

Not one—but many

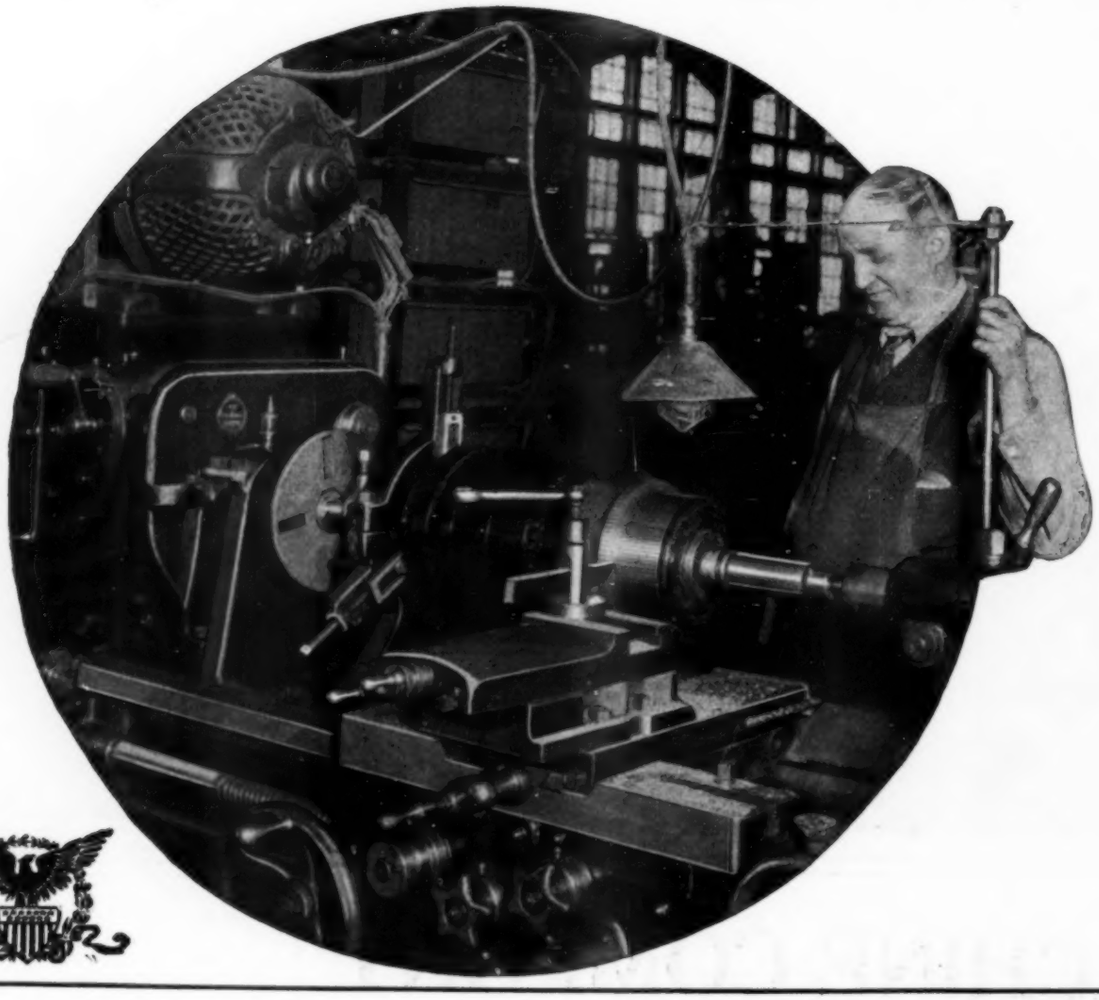
American High Duty Lathes enjoy the reputation of being tremendous producers. They, likewise, never fail to hold to the closest tolerances. No one factor can be held responsible for this performance.

Power and speed are conducive to production, but must be coupled with handy control.

Speed and feed changes are accomplished in "jig time" on the **American,** in fact, about 5 seconds does the trick. Quick reverse is another output advantage.

In the shops of the A. B. See Elevator Company, **American Lathes**

Do it on an AMERICAN High Duty



The American Tool Works

y superior features

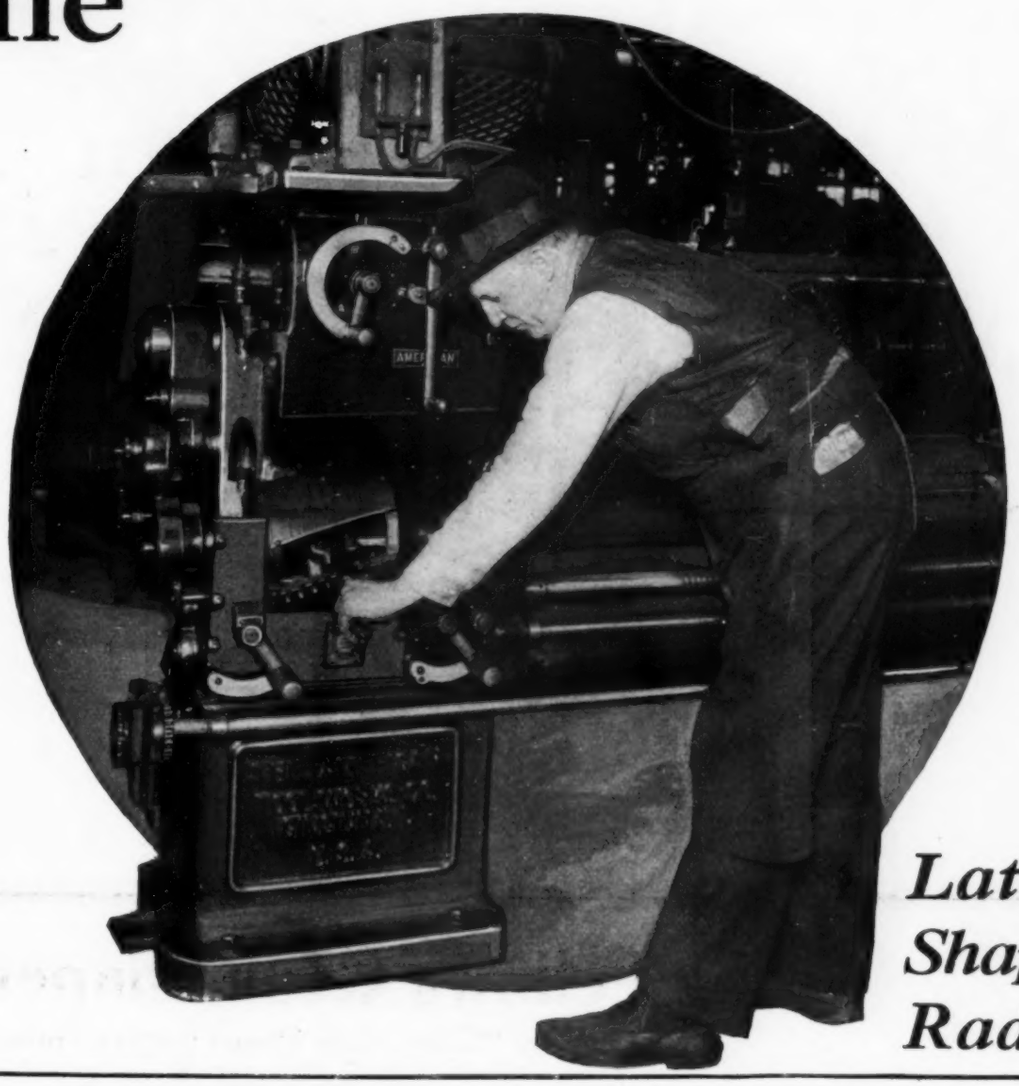
find high favor. They are especially desirable on the production of motor parts.

Turning to finish size a copper commutator end for a 35 hp. motor isn't a "heavy" job, but it requires all the smoothness and precision in the world. Excessive chatter or inaccuracy can quickly throw hundreds of dollars into the scrap pile.

That's another reason why the **American,** famous for tool room precision, is preferred. Of course it is guaranteed accurate to .001—but every mechanic knows that it is good for *much closer limits*, even after years of hard service.

Now is the time to be thinking about improving the precision, power and convenience of your machine tools. "AMERICAN" engineers are proud of their efforts in this respect. May we talk over your problems?

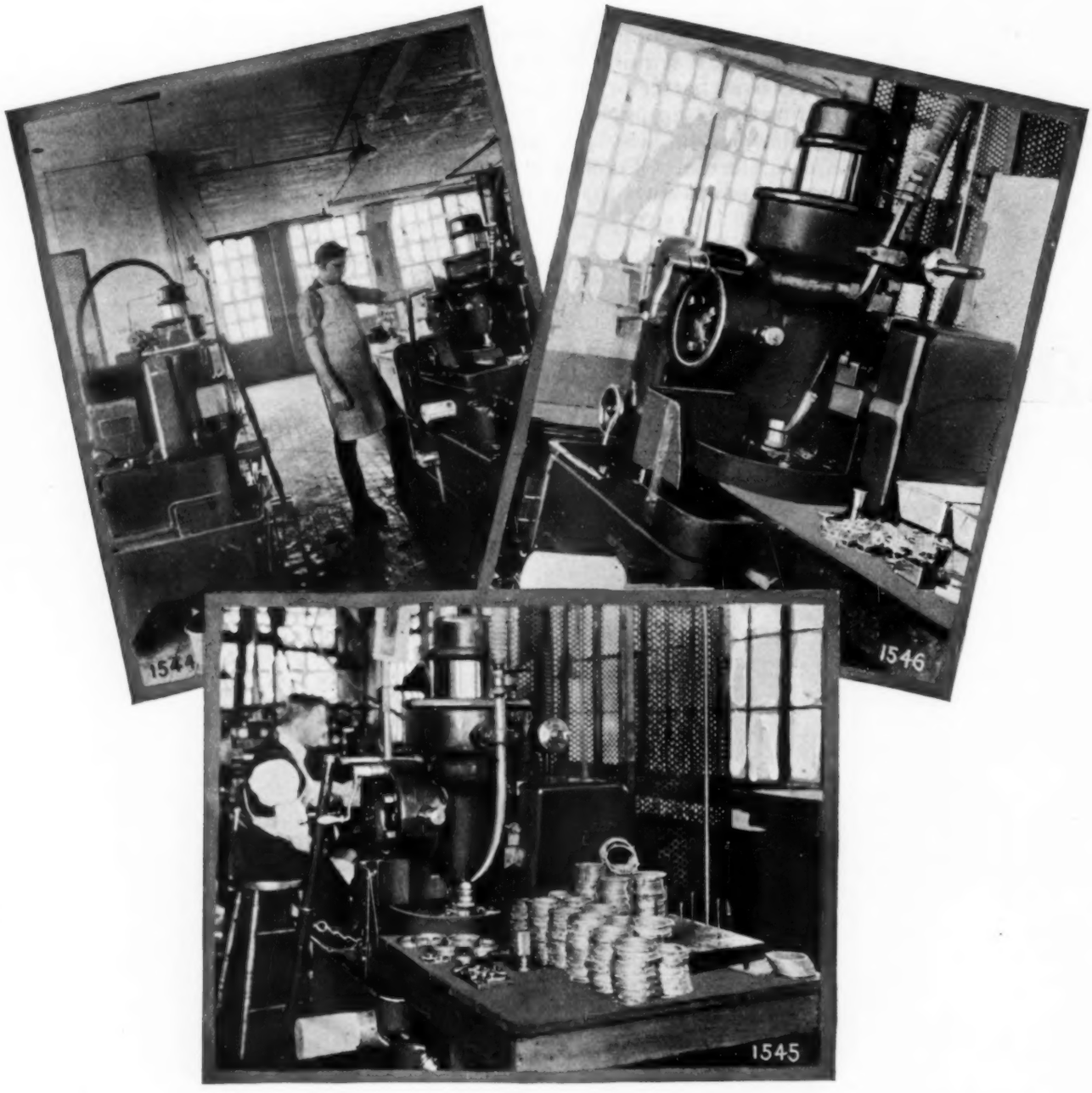
y Lathe



Lathes
Shapers
Radials

s Company, Cincinnati, U. S. A.

Superior product—less



The Fellows Gear Shaper Com

Makers of Gear Shapers, Gear Shaper Cutters, Thread Generators,

Foreign Agents: Alfred Herbert, Ltd., Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Ltd., Yokohama, Japan; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India) Ltd., Head Office, Calcutta, India; Bohm & Bormann, Berlin, Germany.

s handling—lower cost

ANY unit of equipment that will accomplish the above noted results, insures large returns on the investment.

The performance of the No. 7-type Gear Shaper in the plant of the Monroe Calculating Machine Company has made these three important advances in the production of accurate gears.

Production time is now computed in seconds instead of minutes and accuracy is unvarying.

Perhaps you will consider improvements on your present gear cutting methods.

pany, Springfield, Vermont, U. S. A.

Thread Generating Cutters, and Gear-tooth Grinders

Branch Office, 505 Book Building, Detroit, Mich.

Pacific Coast Representatives: Harron, Rickard & McCone, Los Angeles and San Francisco, California; Nevada, Arizona.

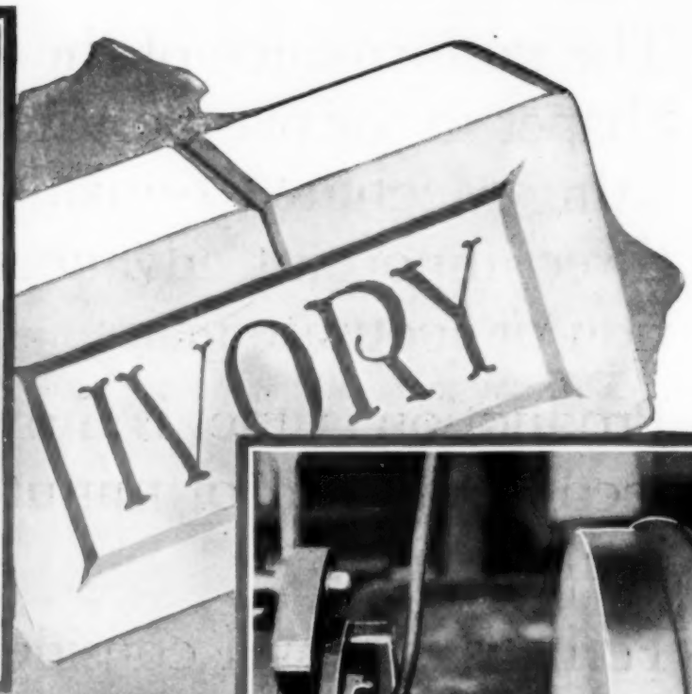
Keeping the Output of IVORY at Peak

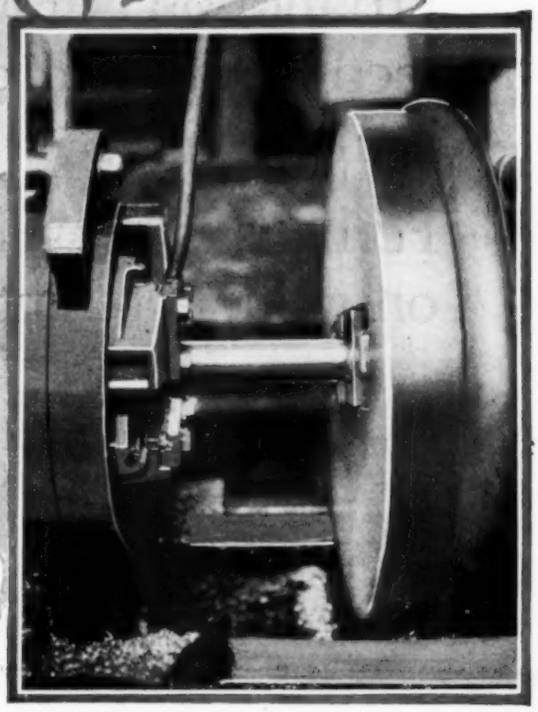
In the plant of Procter and Gamble Co., makers of "Ivory Soap," three LANDIS *Pipe Threading Machines* have been taking care of the construction and repair work for the past five years.

Clean, accurately cut threads are required on the pipe lines in the home of "Ivory," and they must be produced in minimum time with low labor cost.

LANDIS *Threading Machines* require no skill to operate, are quickly and easily set up; cut right and left hand threads by merely grinding both cutting ends and using right and left hand chaser holders and produce in one pass good threads at a speed of 30 circumferential feet per minute. The secret lies to a great extent in LANDIS Chasers.

Let us tell you about them.





LANDIS TRADE — MARK

Pipe Threading Machines

LANDIS MACHINE COMPANY, Incorporated

WAYNESBORO, PA., U. S. A.

DOMESTIC AGENTS: Marshall & Huschart Machinery Co., Chicago, Ill.; Marshall & Huschart Machinery Co., of Indiana, Indianapolis, Ind.; Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; R. B. Whitacre & Co., St. Paul, Minn.; Hamilton Machinery Company, Chattanooga, Tenn.; Seeger Machine Tool Co., Atlanta, Ga.; Young & Vann Supply Co., Birmingham, Ala.; Woodward, Wight & Co., New Orleans, La.; Jos. T. Ryerson & Sons, Houston, Texas; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; Salt Lake Hardware Co., Salt Lake City, Utah; Herberts Machinery & Supply Co., San Francisco and Los Angeles, Calif.; Harry M. Euler Co., Portland, Ore.; Hallidie Machy. Co., Seattle, Wash.; Hallidie Co., Spokane, Wash. CANADIAN AGENTS: Canadian Fairbanks-Morse Co., Toronto and Montreal.

Four Hundred a Day Thrown In!

That's the bonus this Land-Matic Die Head has continued to pay a Western City shop since its installation last year.

It is threading 1½-in. oil barrel plugs at the rate of 1600 per day. Previous production amounted to a cool 400 less—1200 a day.

An item of particular interest to the company was a considerable reduction in die costs immediately evident when the LANDIS head got into production. Clean-cut, accurately-pitched threads, kept well within a .005-in. tolerance are also a factor in their satisfaction.

The economy of LANDIS-cut threads will strike you right. How you can apply it to your shop will interest you. *Write for details today.*

LANDIS Machine Co., Inc.
Waynesboro, Pa.

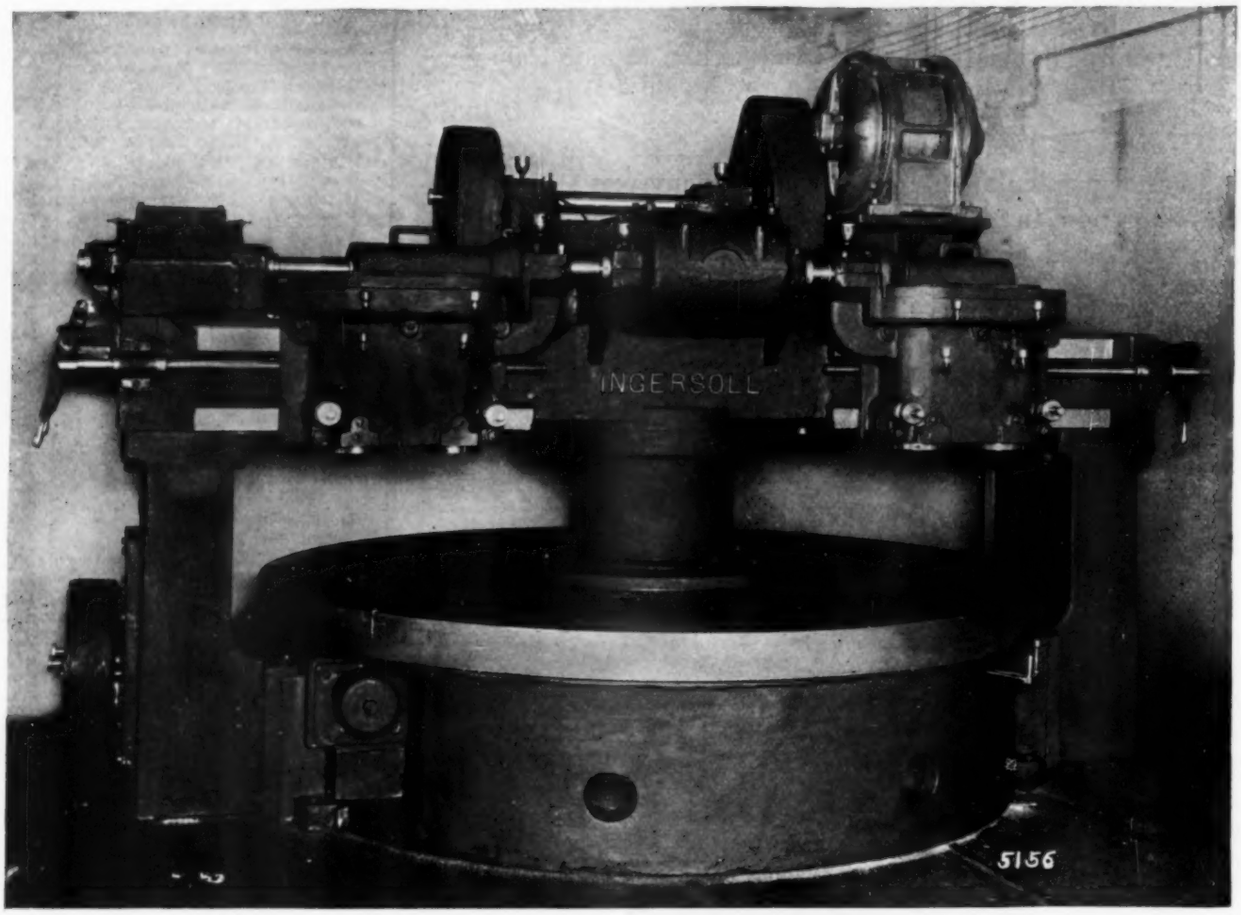
DOMESTIC AGENTS:

Marshall & Huschart Machinery Co., Chicago, Ill.; Marshall & Huschart Machinery Co. of Indiana, Indianapolis, Ind.; Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; R. B. Whitacre & Co., St. Paul, Minn; Hamilton Machinery Co., Chattanooga, Tenn.; Seeger Machine Tool Co., Atlanta, Ga.; Young & Vann Supply Co., Birmingham, Ala.; Woodward Wight & Co., New Orleans, La.; Jos. T. Ryerson & Son, Houston, Texas; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; Salt Lake Hardware Co., Salt Lake City, Utah; Eccles & Smith Co., San Francisco, Calif.; Los Angeles, Calif.; Portland, Ore.; Hallidie Machy. Co., Seattle, Wash.; Hallidie Co., Spokane, Wash.

CANADIAN AGENTS:

Canadian Fairbanks-Morse Co., Toronto and Montreal.

INGERSOLL



An Ingersoll Double Face Fixed Rail Circular Milling Machine

This Two-station Double Face Fixed Rail Circular Milling Machine is an exceptionally rugged tool designed for high production milling. The table is 108 inches in diameter and provided with a taper bushing for taking up the wear.

This is an adjustable circular machine, adjustable in that any standard Ingersoll Fixed Rail Saddle will fit on the rail and each saddle has individual hand adjustment on this rail. Therefore, by changing the fixture and saddles the machine can be changed over to many production milling jobs. It has four two-spindle saddles mounted on the double face fixed rail. The spindles in these saddles are of hardened steel 4½ inches in diameter at the largest taper.

Two operators are required to run this tool, one at each station. They load and unload the fixtures as they pass the loading stations. This is truly a continuous milling machine, as the table travel, which is fixed, controls the production obtained.

We will be glad to furnish you more detailed information on this tool, which is only one of the many special machines we build.

Shall we send you one of the following bulletins?

No. 39—"Ingersoll Continuous Milling Machines."
No. 40—"Ingersoll Installations of Milling Equipment."
No. 41—"Ingersoll Drum Type Continuous Milling Machines."
No. 44—"Ingersoll Milling Cutters."

THE INGERSOLL MILLING MACHINE CO.

Milling Machines and Their Equipment

50 Church Street, New York City ROCKFORD, ILLINOIS 1457 David Whitney Bldg., Detroit

New Departure Ball Bearings

The Triple Function Bearing

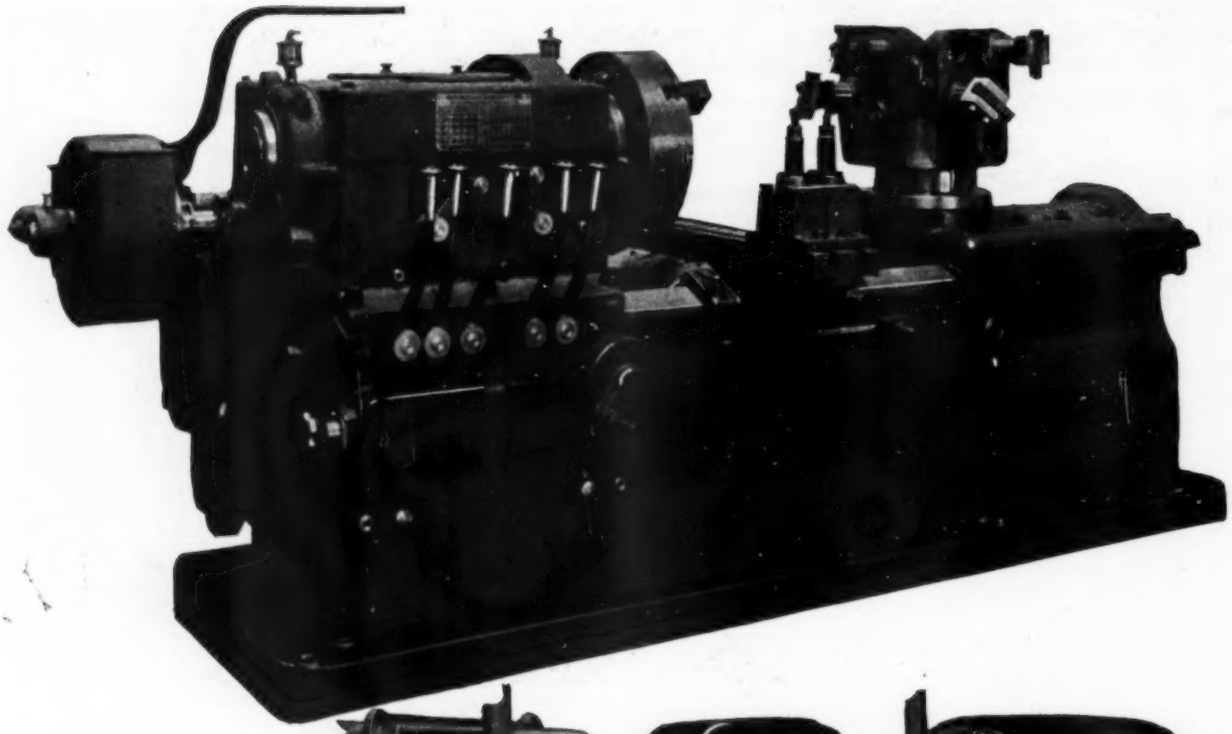
BEFORE the advent of the New Departure *Double Row type* it was customary to use a separate ball bearing for each load function. This meant that often *three* bearings were necessary to do the work for which the New Departure Double Row is now so often specified.

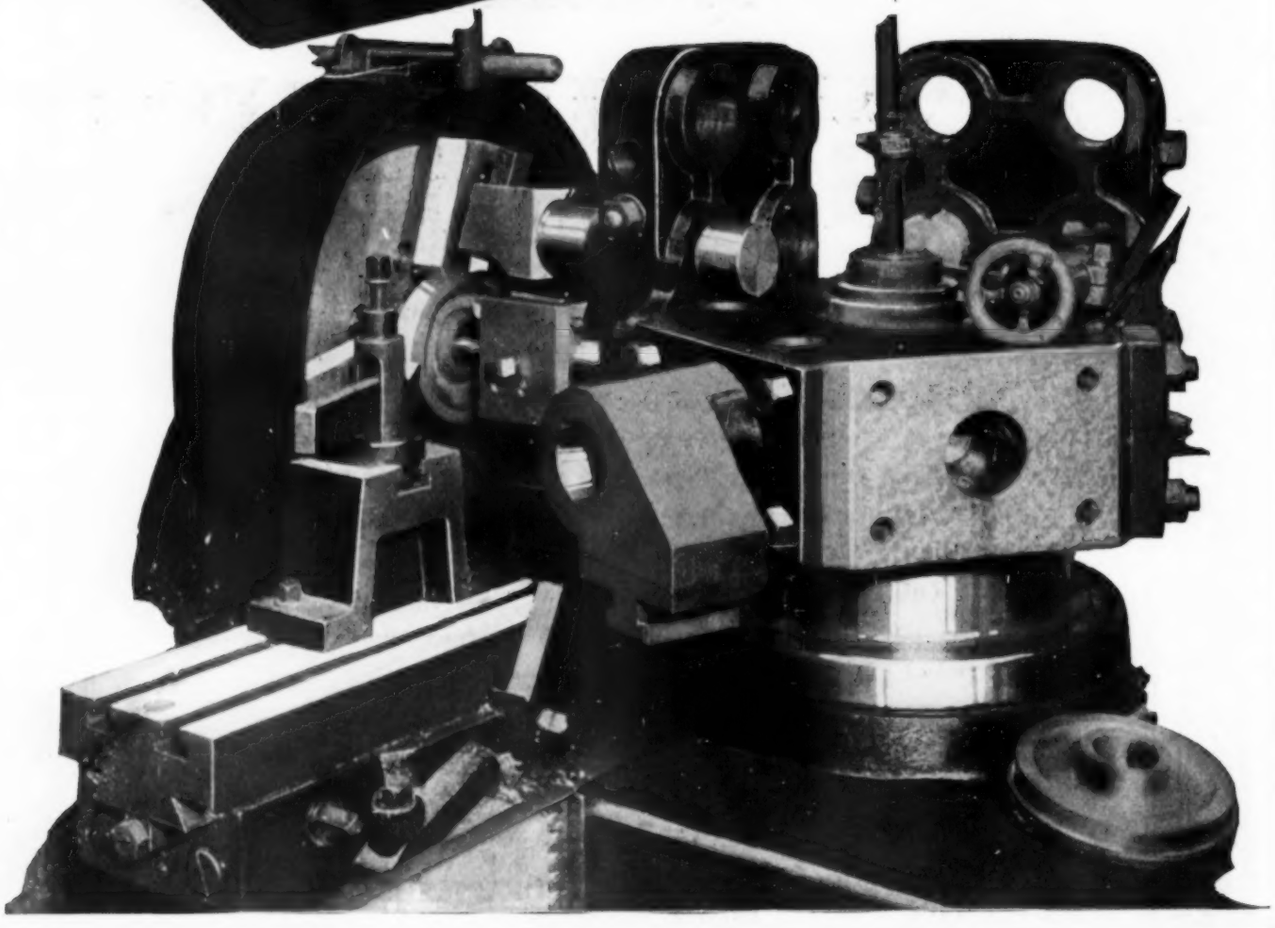
Other and less efficient bearing types than those employing balls can at best perform but two functions: support a radial and a *one* direction thrust load.

Wherever you would combine highest efficiency with the least cost and the least structural complication for supporting a combination of radial loads and thrust in *any* direction, specify the New Departure Double Row type.

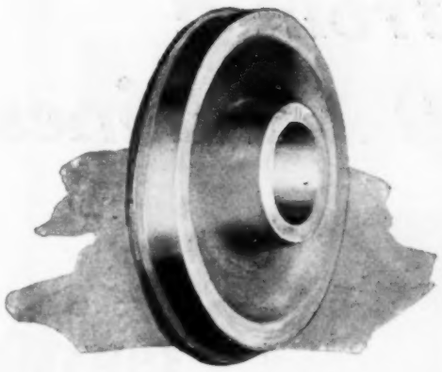
THE NEW DEPARTURE MANUFACTURING CO.,
Detroit BRISTOL, CONNECTICUT Chicago

28





Potter & Johns



Short-circuiting production costs with the New P & J 6-C Automatic

This week we show how the White Motor Co., Cleveland, Ohio, are machining drop-forged gear blanks with their gang of P & J 6-C Manufacturing Automatic Chucking and Turning Machines.

Job-drop forged transmission gear, finished all over in two chuckings. Turn O.D.—face, bore and relieve bearing—form radius. On 2nd chucking; finish bore, ream and turn shoulder.

The White Company is but one of the many Automotive concerns who have received the New P & J 6-C with open arms.

While the new 6-C model is of a universal type, special consideration has been given to the handling of fly-wheels, front hubs, differential carriers, gear blanks, etc.

Ask for Catalog No. 62. It outlines the constructional details and is full of practical suggestions. Besides carefully compiled descriptive matter, we have a great deal of special information that is at your service.

How can we help you to "automatically" lower costs?

POTTER & JOHNSTON

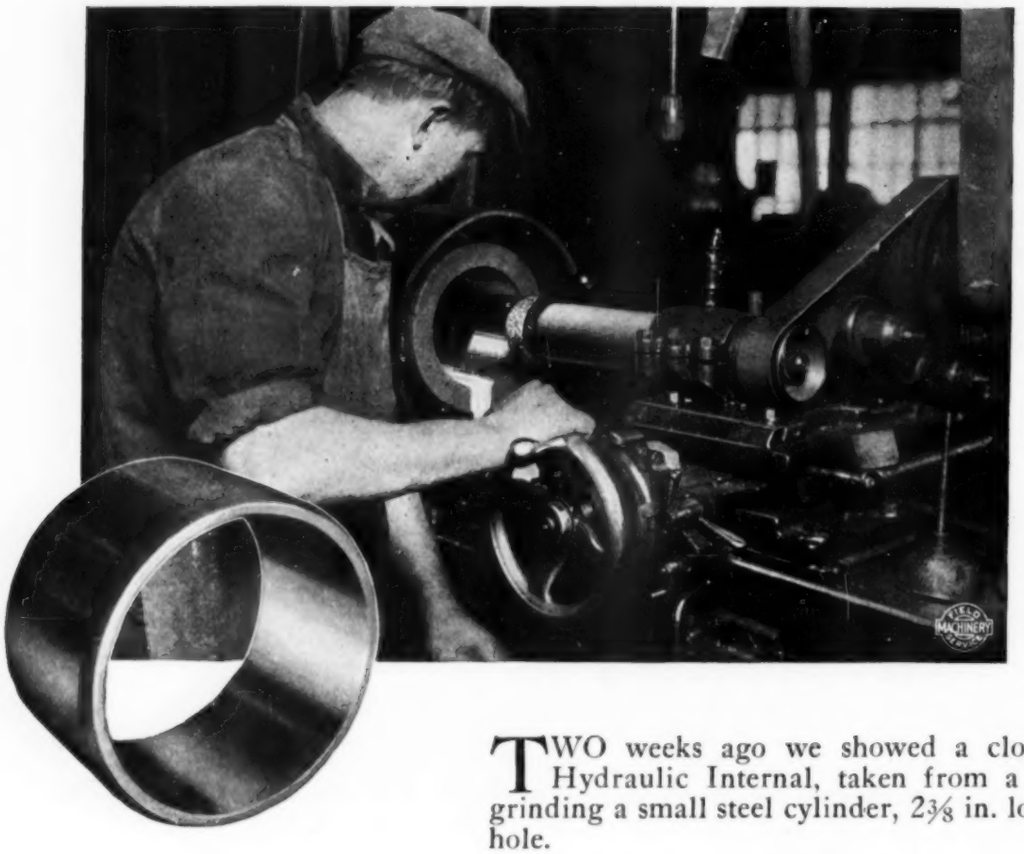
PAWTUCKET, R. I., U. S. A.

DOMESTIC OFFICES: New York Office: Hudson Terminal Bldg., 50 Church St., Walter H. Foster, Manager. Detroit Office: The Potter & Johnston Agency Co., 535 Bates St. Chicago Office: 3057 Eastwood Ave., Leslie J. Orr, Manager. Pacific Coast Office: Rosslyn Hotel, Los Angeles, Cal., Charles H. Shaw, Manager.

FOREIGN REPRESENTATIVES: L. J. Colomb, 68 Avenue de la Grande Armee, Paris, France, Representative for France, Belgium, Switzerland, Spain and Portugal. Charles Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Tyne, England and Glasgow, Scotland. Ercole Vaghi, Corso Porta Nuova, 34 Milan, Italy. Rylander & Asplund, Stockholm, Sweden. Yamatake Company, No. 1 Yurakucho, Ichome, Kojimachiku, Tokyo, Japan.

ton Automatics

Another "Close-up" from a Battery of 80 Machines



GRIND WITH A HEALD AND BE SURE

TWO weeks ago we showed a close-up of a Heald Hydraulic Internal, taken from a battery of eighty, grinding a small steel cylinder, 2⅜ in. long with a 1.625-in. hole.

Above is another machine from the same group, grinding much larger work, a steel ring 4⅞ in. long with the diameter of hole 7.500 in.

The Heald Hydraulic Internal Grinder

Before putting in this battery of Heald Hydraulics careful data of all kinds was compiled from actual runs on various sizes of work. Whether the work was large or small, in all cases the results were so overwhelmingly in favor of Heald that orders were placed for eighty.

Regardless of what your internal grinding is, large or small, general or unusual, regular or special, send in a few hundred and let us grind them to your requirements. We are sure that the data and production figures will be very interesting and will convince you that the Heald Hydraulic will save you money.

THE HEALD MACHINE COMPANY

35 New Bond Street, Worcester, Mass.

NEWTON

(REGISTERED TRADE-MARK)

Continuous Millers

MAXIMUM PRODUCTION

at

MINIMUM COST

If you have a production job that can be milled continuously, we build a machine that will do it most economically.

Submit us your blueprints and we will gladly give you production estimates and full details.

NEWTON MACHINE TOOL WORKS, PHILADELPHIA, PA.

Modern Magic Chucks

A new type Friction Tapping Collet for the Modern Magic Chuck, one that can be set to a very sensitive friction for driving small Taps to the bottom, or driving coarse pitch Taps to its maximum capacity, every Magic Chuck equipment is incomplete without this new type collet.

Other Tools Manufactured at Modern Tool Works

Self-Opening Die Heads	Magic Drill Chucks	Inserted Tooth Face Milling Cutters
Solid Adjustable Die Heads	Friction Collets	Self-Opening Stud Setters
Threading Machines	Tapping Attachments	Collapsible Taps

PLAIN AND UNIVERSAL GRINDING MACHINES

Modern Tool Works, Erie, Pa.

OF THE

CONSOLIDATED MACHINE TOOL CORPORATION OF AMERICA

GENERAL OFFICE: WILMINGTON, DELAWARE

BETTS Rochester	COLBURN Rochester	HILLES & JONES Wilmington, Del.	MODERN Erie, Pa.	NEWTON Philadelphia
Engine Lathes	Drill Presses	Punches and Shears	Plain and Universal Grinders	Cold Saws
Boring Mills	Special Drills	Bending Rolls	Threading Machines	Crank Planers
Planers	H. D. Boring Mills	Plate Planers	Self-Opening Dies & Taps	Milling Machines
Slotters	Standard Boring Mills	Flanging Clamps	Magic Chucks & Stud Setters	Rod Borers
Axle Lathes, Etc.	Rod Boring Machines, Etc.	Straightening Rolls, Etc.	Insert. Tooth Face Mill Cutter	Cylinder Borers, Etc.

Compare Specifications

of any other lathe of equal swing with Monarch. Use this sheet for comparison on your next lathe purchase.

We are proud of the specifications of Monarch Lathes. They are properly proportioned. So we print in all our circular matter full specifications on all sizes of Monarch Lathes.

The swing over bed must be the same for a just comparison.

	MONARCH.....	.....	.....	.....	.....
Swing over bed	.....	.....	.....	.....	.....
Swing over carriage	.....	.....	.....	.....	.....
Takes between centers, tailstock flush	.....	.....	.....	.....	.....
Takes between centers, tailstock overhung	.....	.....	.....	.....	.....
Base length of bed	.....	.....	.....	.....	.....
Base length shipping weight	.....	.....	.....	.....	.....
Weight extra two feet bed length	.....	.....	.....	.....	.....
Hole through spindle	.....	.....	.....	.....	.....
Front spindle bearing	.....	.....	.....		
Rear spindle bearing	.....	.....	.....		
Center Morse Taper	.....	.....			
Spindle nose, diameter and threads per inch	.....	.....			
Lead screw diameter and threads per inch	.....				
Range of threads per inch, quick change	.....				
Range of feeds per inch, quick change	.....				
Headstock base length					
Tailstock base length					
Tailstock spindle diameter					
Tailstock spindle traverse and set-over					
Carriage length					
Carriage bridge width					
Compound rest top slide travel					
Countershaft friction pulleys, size					
Head and countershaft cone step diameters, double back gears					
Head and countershaft cone step face, double backgears					
Geared head driving pulley, diameter face					
Width of bed					
Depth of bed					
Regular equipment consists of					

We guarantee every MONARCH Lathe to give complete satisfaction to the purchaser.

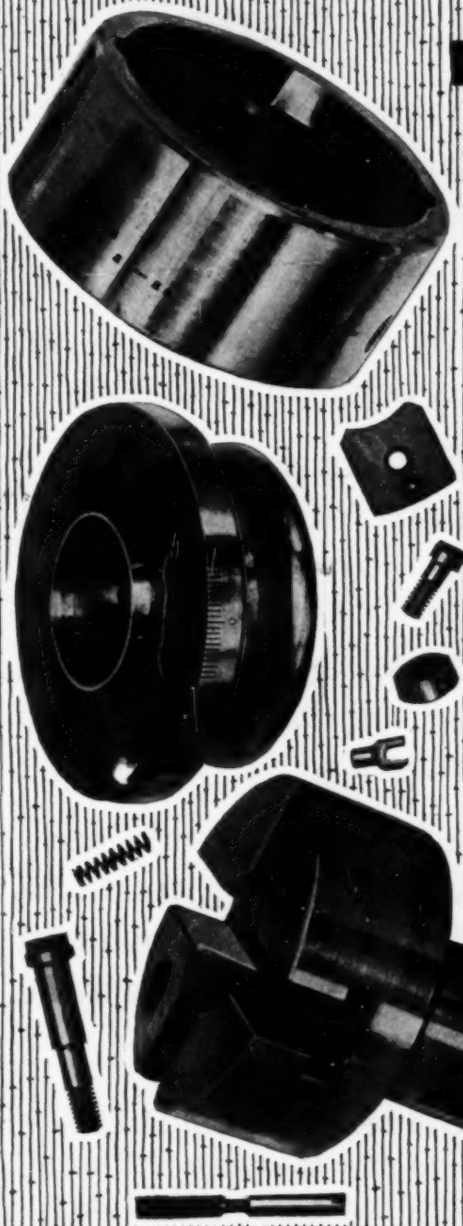
The Monarch Machine Tool Co.

307 Oak Street, Sidney, Ohio

HARDENED—

for wear

NAMCO hardened DIES



A Simple Tool for Difficult Work

There are only 10 distinct parts, exclusive of the chasers, used in the assembly of a NAMCO Hardened Self-Opening Die Head of the Revolving Type for use on Automatic Screw Machines and other equipment where the tool is revolved. The parts used are shown in the margin. Count them for yourself.

Do you know of any die head with as few parts?

This simplicity in construction means rigid chaser support—the chasers are supported in a solid core piece and backed directly by the hood or cup with no intermediate parts to spring or wear; it means easy adjustment—no fussy parts; it adds years to the life of the tool.

And you'll find each and every part in this NAMCO Die hardened and ground—it's a long lived tool. You'll find it positive and automatic in opening and closing. And you'll find that NAMCO Chasers are lapped and carefully inspected before shipment, and will give you clean cut accurate threads.

Give a good tool a chance—
Try NAMCO Dies.

Send B/P or Samples for figures on your threading.

The National Acme Co.

Cleveland, O.

NEW YORK · CHICAGO · DETROIT · BUFFALO · BOSTON

BRUBAKER

Nut and Tapper Taps

Uniformity is an outstanding factor in Brubaker Nut and Tapper Taps.

This covers both temper and performance.

They cut faster without danger of breakage and cut longer between grinds, thus directly increasing output and lowering the cost per piece produced.

Uniform material; uniform temper; uniform workmanship; uniform life; can you ask for more in any tool?

Get the Brubaker Catalog and note the range of Dies, Reamers, etc., and the reasonableness in prices.

W. L. BRUBAKER & BROS. CO.

Factory: Millersburg, Pa.

Sales Office: 50 Church Street, New York

Shown in panel is a 400 H. P. drive operating wire drawing blocks in the Roebling's plant where the cables used in the Brooklyn Bridge were made.

How John A. Roebling's Sons Co. Uses Link-Belt Silent Chain Drives

Other Link-Belt Products

Conveyors for Coal and Ashes and all materials.
Locomotive Cranes.
Crawler Cranes.
Electric Hoists.
Skip Hoists.
Portable Loaders.
Roller Chain Drives.
Leading manufacturers of Elevating, Conveying and Power Transmission Machinery.
Send for catalogs.

NO waste of power—no slippage—but an effective drive, one that is compact and enclosed in an oil-retaining, dust-proof "Safety First" casing.

Operates on short centers—the saved space can be utilized for work, especially where manufacturing is done.

Link-Belt Silent Chain is flexible as a belt—positive as a gear—more efficient than either. 98.2% efficient on actual test.

It is the ideal drive for line shafting and from motor to machine—on pumps, blowers, fans, compressors, machine tools—in fact wherever the efficient transmission of power is desirable.

Send for Link-Belt Silent Chain Data Book No. 125.

LINK-BELT COMPANY

PHILADELPHIA, 2045 Hunting Park Ave. CHICAGO, 300 W. Pershing Road INDIANAPOLIS, P. O. Box 85 Branches in Principal Cities

1541

LINK-BELT
SILENT CHAIN DRIVES

IT'S LIKE FEEDING LUMBER TO A SAW

THIS new Aloxite-Redmanol Cut-Off Wheel fairly walks through the hardest, toughest of metals.

It cuts any and all kinds of steel or alloys—even Stellite, with a speed and ease never before possible. It cuts without burning, leaving little or no burr.

There is no binding—just the free, clean, cutting action of a wheel that is unrivaled in this field of work.

And this new Aloxite-Redmanol Cut-Off Wheel is strong, durable and tough.

Because of its resiliency it withstands side strains and it will take heavy cuts without stalling or creating undue heat.

The development and perfection of the Aloxite-Redmanol Wheel marks but another step in grinding wheel progress made possible by Carborundum Service to Industry.

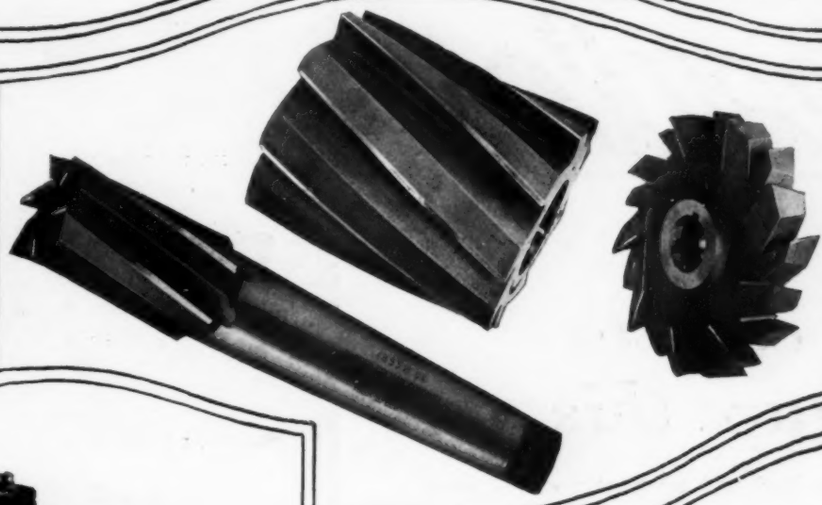
THE ALOXITE-REDMANOL CUT-OFF WHEEL

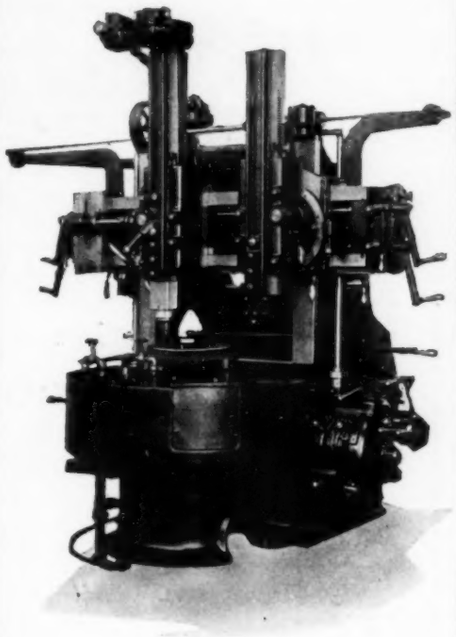
THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y., U. S. A.

New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Grand Rapids, Milwaukee

The Carborundum Company, Limited, Niagara Falls, Ont.





Gisholt Machine Co.

Consistent Buyers of B-C Milling Cutters

It is significant that Gisholt, known wherever machine tools are bought, is a consistent buyer of Barber-Colman Milling Cutters.

It all goes to show that the best informed and most careful buyers of milling cutters in America find in B-C Cutters, tools that measure up to their requirements.

The Cutters that Gisholt and other leaders in the industry buy are the Cutters that it is safe for you to buy.

Manufacturers of

B-C Hobbing Machines
B-C Hob Sharpening Machines
B-C Hobs and Milling Cutters

BARBER-COLMAN COMPANY
ROCKFORD, ILL. U.S.A.

Peerless

It's easy to figure this out

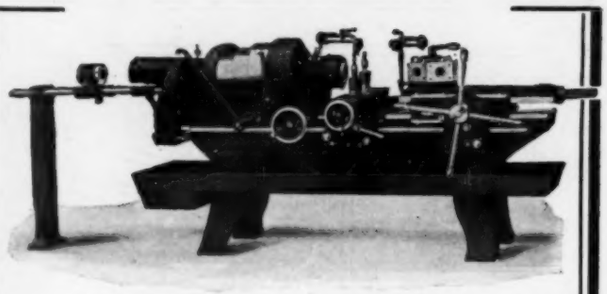
The parts that are cut off from bar stock and faced afterward generally require a roughing and finishing cut. If you add the width of the two facing operations on each side of the part you will find that this waste of material may be reduced more than one-half by using the Peerless Shaping Saw. The material saved and the time saved thru eliminating facing operations will surprise you.

Check our mathematics and write for the facts.

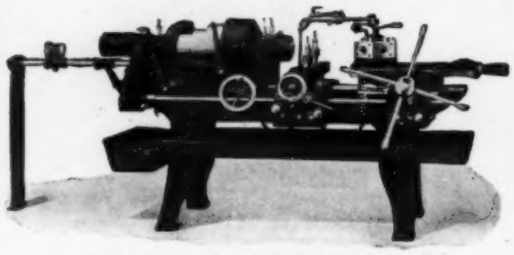
The saving made in one year will buy several saws.

Peerless Machine Co.
1358 Clark St., Racine, Wisc.

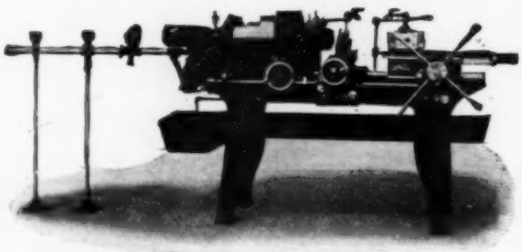
UNIVERSAL SHAPING SAW



No. 7 Friction Head—Capacity 2 9-16x11 inches.



No. 5 Friction Head—Capacity 1 13-16x9 inches.



No. 3 Friction Head—Capacity 1 5-16x7 inches.

FOSTER.

Let us give their actual records

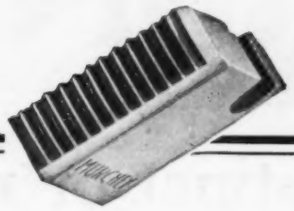
Words mean a lot but not unless they translate facts. Our words are "The Foster Line of Screw Machines (five sizes) is designed to lower tool room overhead." This is a fact verified by operating records on miscellaneous work. These records give the complete story briefly. The figures will be cheerfully quoted on request to any of our two offices.

FOSTER
Machine Company
Elkhart, Indiana

New York Office:
30 Church St., Room 332
Chicago Office:
549 W. Washington Blvd., Room 611

SCREW MACHINES

Collapsible Tap



High Speed Steel Chaser

A THREADING QUESTIONNAIRE

How many questions can you check "yes" to?

☑ **Are you still spending money for solid taps and dies, 75 per cent of the value of which must be discarded when worn?**

Murchey Self-Opening Dies and Collapsible Taps last a lifetime—only the comparatively inexpensive chasers wear out.

☑ **Are you content to thread at carbon steel speed—half what it should be?**

***The MURCHEY WAY*—high speed steel chasers permit double the speed and last five times as long as solid carbon tools.**

☑ **Have you reduced your tool investment by standardizing, or do you carry a crib full of "mongrel" tools?**

Murchey Threading Tools offer the utmost in economy and simplicity—a few sizes of Self-Opening Dies and Collapsible Taps backed by a small stock of high speed steel chasers—the maximum of range at the minimum investment.

It's easy to gradually swing into the economical MURCHEY WAY?

Drop a postal in tonight's mail for the MURCHEY Threading catalog, and get all the data.

Murchey Machine & Tool Co.

953 Porter St., Detroit, Mich., U. S. A.

Cleveland Office, 6523 Euclid Avenue; Pittsburgh Representatives, Laughlin & Barney, Union Trust Bldg.; Chicago Representative, R. E. Ellis Engineering Co., 621 Washington Blvd.; Philadelphia 813 Atlantic Bldg.; Los Angeles Representatives, Smith-Booth-Usher Co., 228 Central Ave.; San Francisco, Smith-Booth-Usher Co., 50-60 Fremont St.; Coats Machine Tool Company, 14 Palmer Street, Westminster, London, S. W., England; Fenwick, Freres & Company, 8 Rue de Rocroy, Paris.

MURCHEY Double-End Machine

Drills, Taps, Threads, Reamers, Chamfers, both ends at once—using one operator—at one-half the cost.

Write for the catalog!

Self-Opening Die Head

MURCHEY
Threading Tools

CONELESS

Instinct or reason— the deciding factor

Some things such as luxuries—are bought because we "instinctively" like them.

Not so with lathes, however! They are bought on a strictly utility basis. Only plain cold reason is the deciding factor.

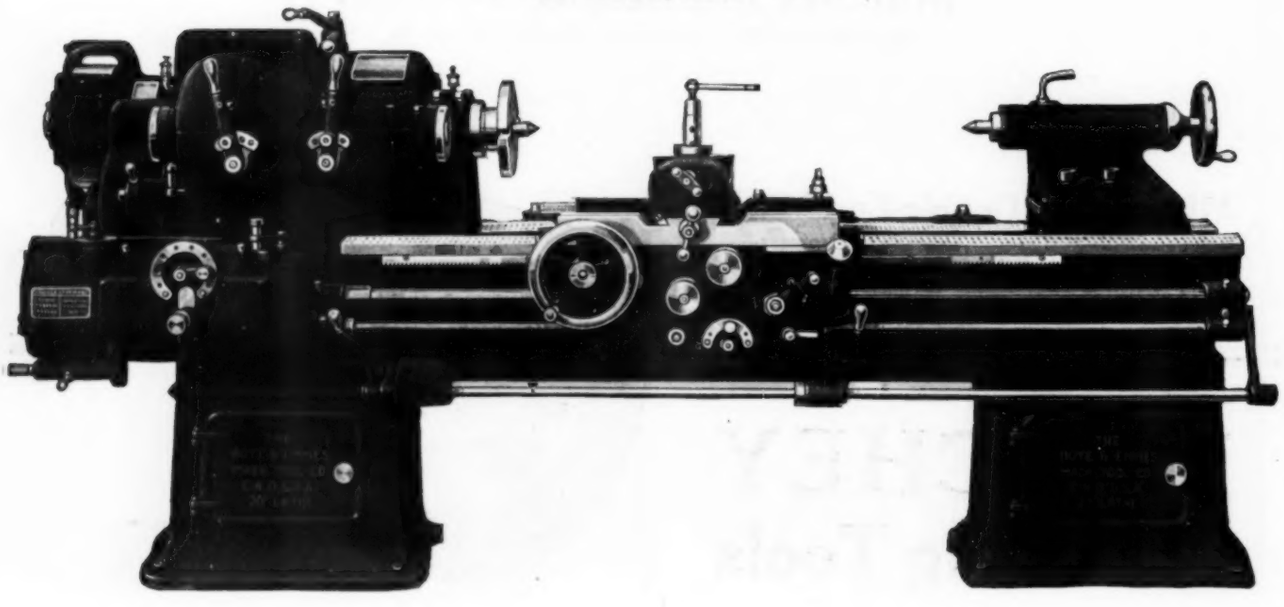
When considering lathes think of "Coneless" and note these five points:

1. Twelve Main Spindle Speeds—absolutely selective—with thirteen gears that are always in mesh.
2. Lathe Spindle Control by means of a lever at the right-hand end of apron—with an auxiliary lever on same controller at end of headstock.
3. Tailstock of the cutaway type, which permits swivelling of compound rest parallel with the shears.
4. Double Plate Apron with the mechanism so arranged that longitudinal and cross feeds cannot be engaged when screw-cutting.
5. Gear Box entirely enclosed, with steel gears throughout.

These points give only a sketchy idea of "Coneless" Lathes—ranging in size from 18 in. to 36 in.

To get complete details of all our lathes send for our catalogs.

The Boye & Emmes Machine Tool Co.
Cincinnati, Ohio



"Functions the best of any machine with which we have ever had experience"

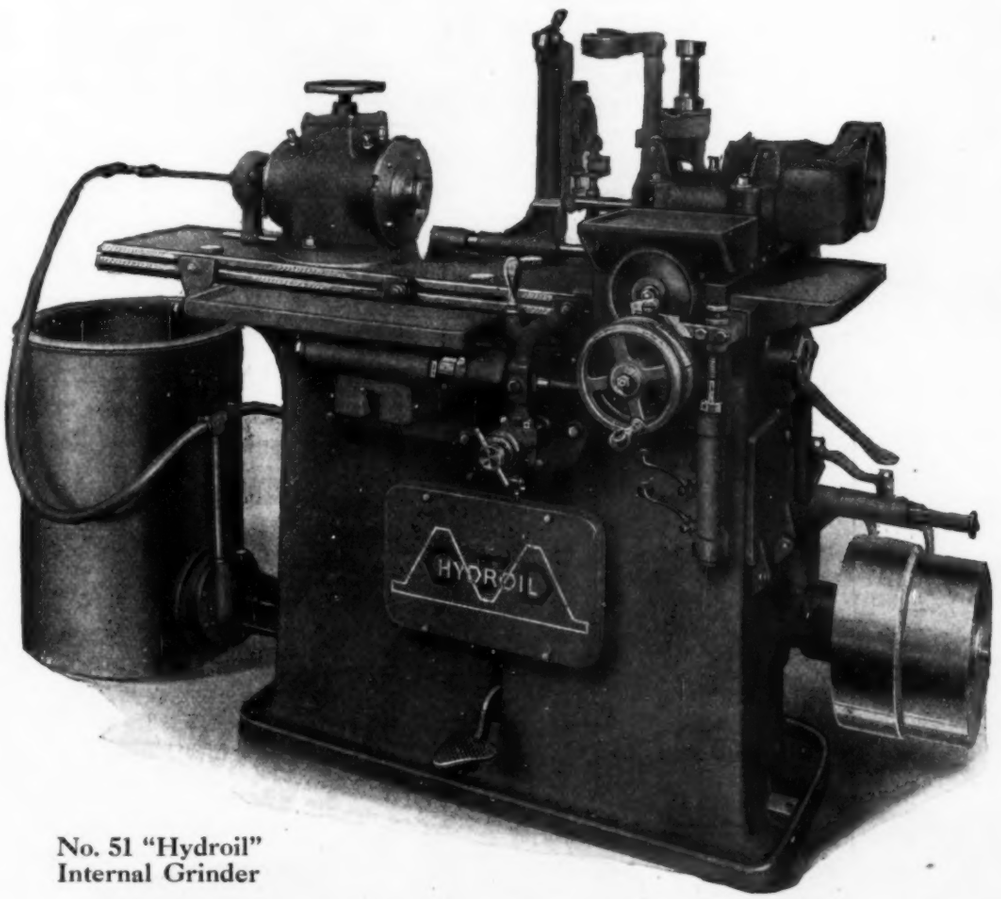
Such was the statement made after a recent installation of a "Hydroil" Internal Grinder.

Such reports are common as new users become familar with the operating mechanism of GTD Internal Grinders and, of course is the result of our many years' experience with the hydraulic principle of operation.

The "Hydroil" is the Original Hydraulic Internal Grinder and is *entirely* hydraulic in action. Table reciprocation, table reverse, quick separation of wheel and work, auxiliary valve mechanism, controls and cross feed of the wheel are all actuated by oil under pressure.

"If it's not the 'Hydroil' it's not Hydraulic."

Let us also prove to *you* that the No. 51 "Hydroil" for small work is the fastest internal grinder on the market. It will cost you nothing to send samples to our factory.



No. 51 "Hydroil" Internal Grinder

Agents:

Manning, Maxwell & Moore, Inc.
New York Philadelphia Pittsburgh

Crane-Schiefer-Owens, Inc.
Syracuse Rochester Buffalo

The Strong Carlisle & Hammond Co.
Cleveland Detroit

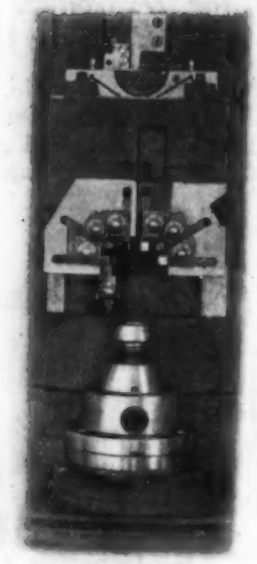
The E. A. Kinsey Co.
Cincinnati Indianapolis

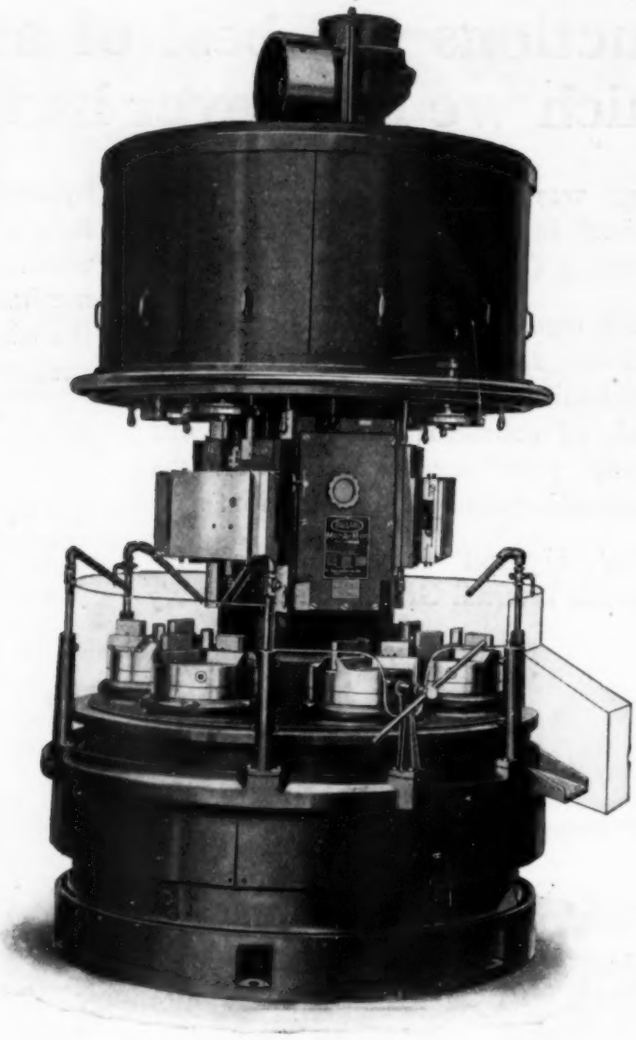
The E. L. Essley Machinery Co.
Chicago Milwaukee

Write for Bulletin No. **101**

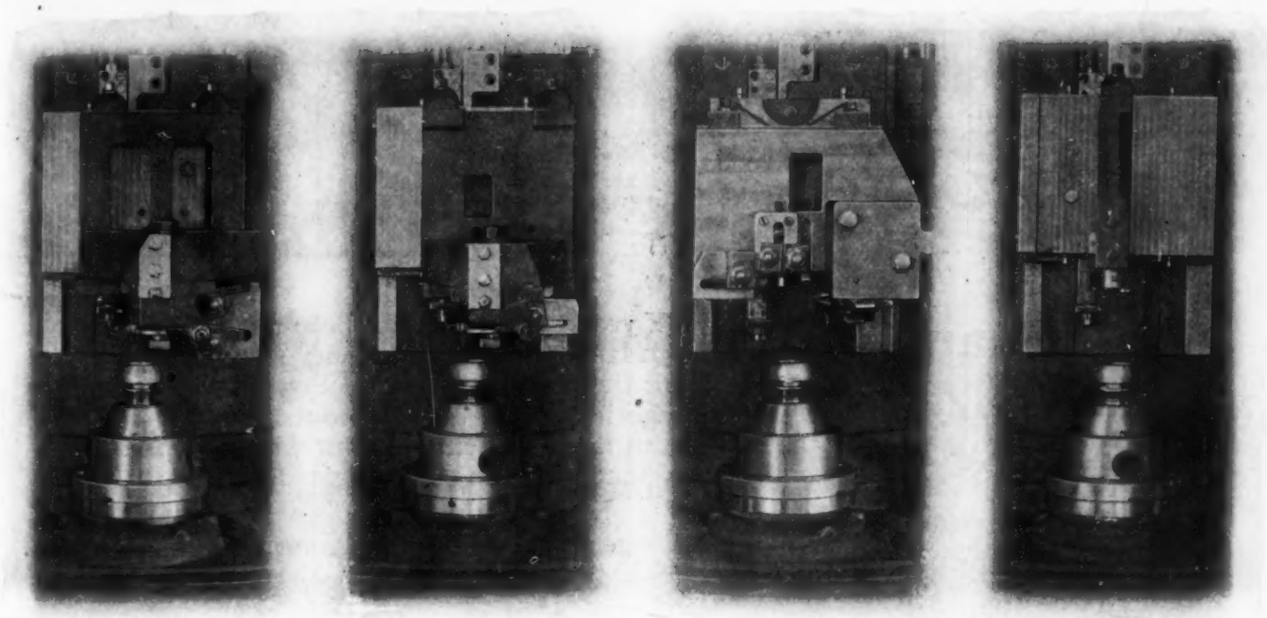
GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

GTD **TAPS DIES SCREW PLATES TWIST DRILLS REAMERS PIPE TOOLS MILLING CUTTERS**





The MULT-AU-MATIC



Transmission Gear Blanks

These gear blanks are of exceptionally tough alloy steel forgings with deep outside and inside recesses.

From smallest to largest the time ranges, in unit production, from thirty (30) seconds to thirty-six (36) seconds with a daily production of from seven hundred sixty-five (765) pieces to nine hundred eighteen (918) pieces per day.

After the blank is loaded at the first station, the work performed at the succeeding stations is a series of multiple operations performed progressively and simultaneously.

A finished piece is removed at each index of the machine. Six finished pieces for each revolution of the carrier.

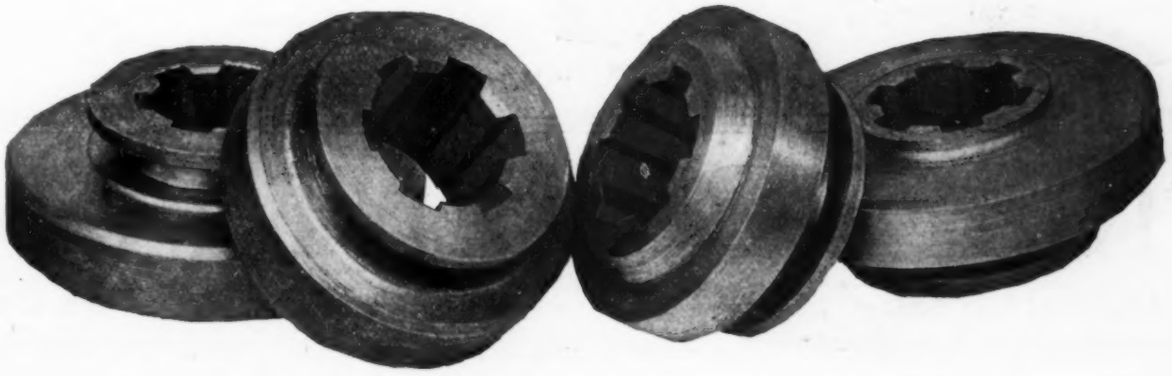
The Mult-Au-Matic controls production and costs

The Mult-Au-Matic is not subject to the fluctuating temperaments of different operators. The machine sets the pace for the operator.

Send us your prints. Our Engineers will show you how your costs can be lowered and controlled.

The Bullard Machine Tool Company

Bridgeport, Connecticut

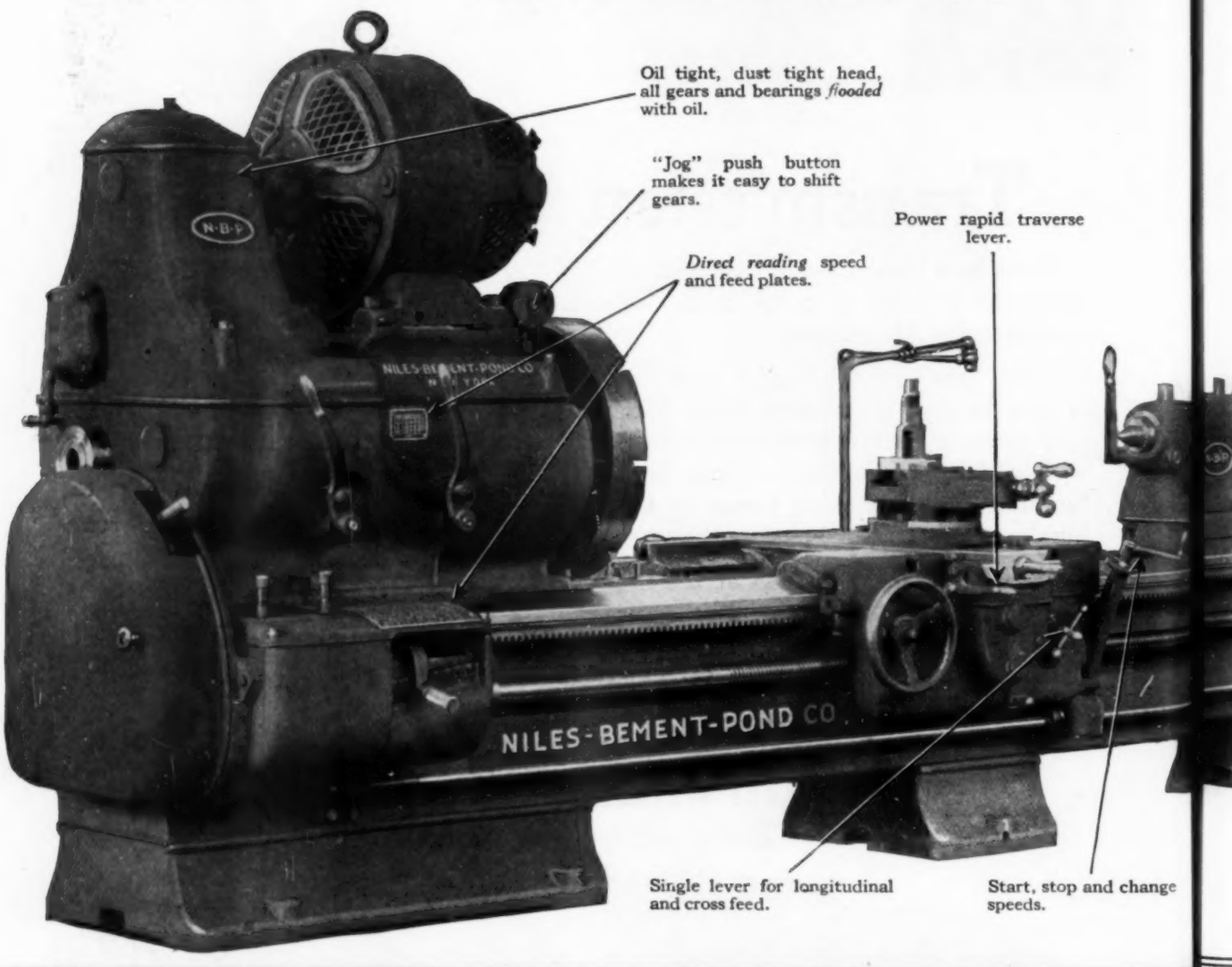


Something New

A 27-in Lathe with power rapid

In 30- and 36-in. sizes, too

FIFTY years' experience has been put into this new design lathe to make it a money saver and a profit maker for the man who uses it. Power rapid traverse to carriage is perhaps its most outstanding feature. This aid to faster and better work will be appreciated by every man who has ever operated a lathe.


Oil tight, dust tight head, all gears and bearings *flooded* with oil.
"Jog" push button makes it easy to shift gears.
Power rapid traverse lever.
Direct reading speed and feed plates.
NILES-BEMENT-POND CO
Single lever for longitudinal and cross feed.
Start, stop and change speeds.

NILES-BEMENT-POND

General Offices: **111 Broadway, New York City**

under the Sun!

traverse to carriage

Power rapid traverse not only moves the carriage at least four times as fast as by hand but it eliminates the back-breaking manual labor of moving the carriage up and down the bed. By conserving the operator's energy it allows him to devote all his time and attention to operating his machine to the best advantage.

Other aids to simplified and easy manipulation that speed up operation include:—

—direct reading index plates for rapid selection of feeds and speeds

—single lever for both cross feed and longitudinal feed

—jogging switch for slowly turning over gears to expedite gear shifting or for bringing work to proper position

—thread dial that makes it unnecessary to reverse spindle for thread cutting

—control on the apron for stopping and starting motor or changing speeds on d.c. drives

—compact apron that permits the operator to stand close to his work without bending.

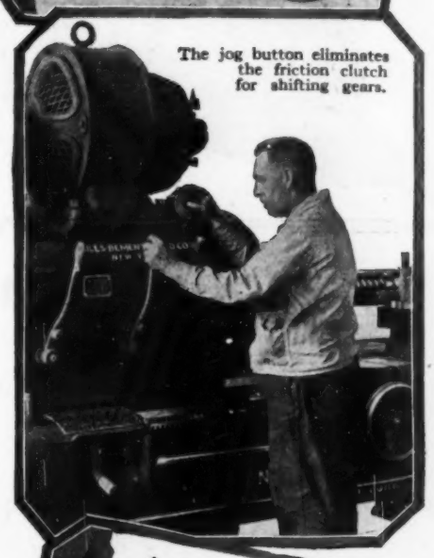
How long life is assured

To prolong life of alignment and to insure long, continuous service this lathe is furnished throughout with strong heat treated Maag Gears; all gear shafts are supported at both ends; driving gears of large diameter are fully enclosed in a dust and oil-tight head and all gears and bearings are flooded with oil as are the feed gears and bearings; bed is cast of semi-steel with solid web over top to tie ways together and has "LeBlond" Compensating ways for carriage; apron is made with double walls.

We know this lathe is right

These lathes during the past two years have been given an exhaustive test in our Pond Works at Plainfield, N. J. They've stood up brilliantly. Every man who has operated one or watched it at work is a booster for it. These men know a good lathe when they see one and they call this "The Time-Saver Lathe." We'll be glad to tell you more about it.

The power rapid traverse in action. Removing the fatigue from lathe operation.



The jog button eliminates the friction clutch for shifting gears.

A compact apron makes it easy for the operator to stand close to his work.

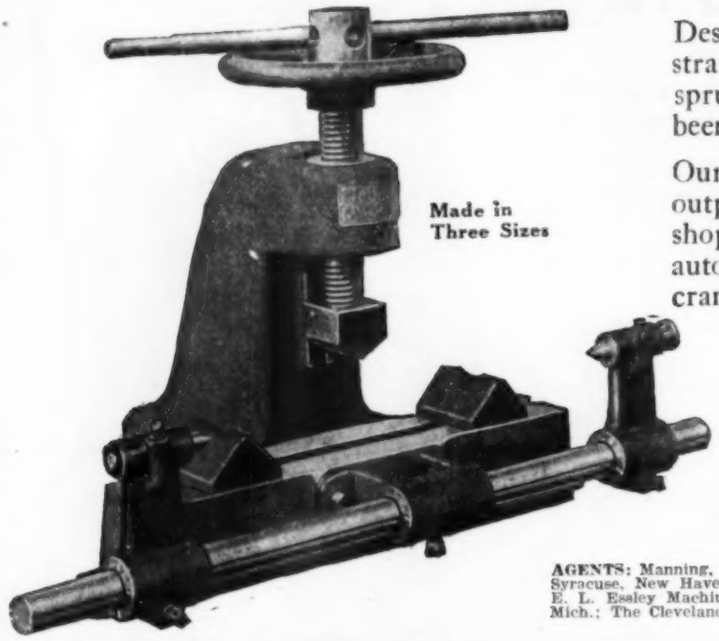
They're "Time Savers"

COMPANY

SALES OFFICES: New York, Rochester, Birmingham, Boston, Philadelphia, Cleveland, Pittsburgh, Detroit, Chicago, St. Louis, Cincinnati, St. Paul, San Francisco, Los Angeles

SPRINGFIELD Straightening Presses

For Shop and Toolroom Use



Made in Three Sizes

Designed especially not only to center and straighten work in the rough and pieces sprung in use—but reamers, etc., which have been sprung in tempering.

Our sales records show that 80% of our total output is being used for general machine shop practice, particularly by garage and automobile manufacturers for straightening crank and cam shafts, Ford alone using over 800 because of their usefulness and the savings they effect. They are invaluable for use in toolrooms also.

Write for Circular No. 101

The Springfield Machine Tool Co.
Springfield, Ohio, U. S. A.

AGENTS: Manning, Maxwell & Moore, Inc., New York, Boston, Philadelphia, Buffalo, Syracuse, New Haven, Pittsburgh, St. Louis, San Francisco, Seattle, Cincinnati; The E. L. Essley Machinery Co., Chicago, Ill.; The Riverside Machinery Depot, Detroit, Mich.; The Cleveland Duplex Machinery Co., Cleveland, Ohio.

Poor threads make fat scrap piles

4½ inch Style D

When a part requiring a series of operations is spoiled due to faulty machining, it cuts materially into the profits on the job.

Unreliable screw threading equipment are the cause of much of this loss. Geometric Threading Tools are reliable under all conditions. They put an end to all the troubles you have experienced with such tools.

In hundreds of shops Geometric Tools are standard equipment and are daily establishing unrivalled performance records.

Let us tell you what they can do in your case.

THE GEOMETRIC TOOL CO.
New Haven, Conn., U. S. A.

Short Story of a Big Achievement—

THE story of a machine which saves money. For all plants—small, medium, and large. A simple machine. A reliable machine. An efficient machine. One which reduces operating and production worries.

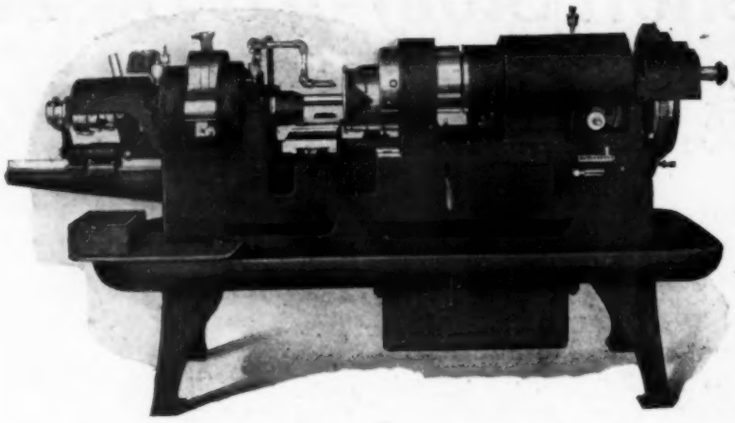
(*Continued in the next issue.*)

INGERSOLL-RAND COMPANY-11 BROADWAY, NEW YORK CITY.
Offices in all principal domestic and foreign cities.

Ingersoll-Rand

Adaptability
is the prime factor in all
CLEVELANDS

LEVELAND'S APACITY UNEQUALED



Do You Get To A Saturation Point in Production?

Over-production leads to top-heavy inventories.

Is it economy?—Some think not. BUY THE "CLEVELAND."

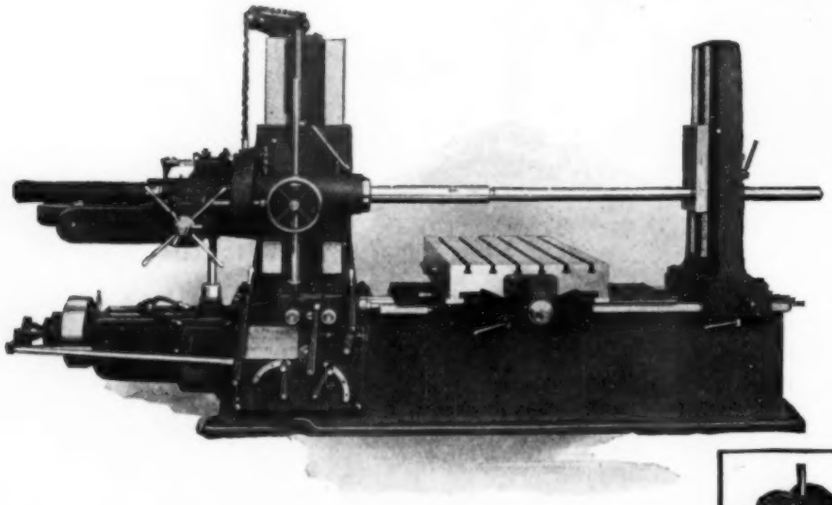
The short time taken to set up a "CLEVELAND" on a job don't make you want to run requirements for one or two years on any one class of product to absorb the set-up cost.

USE "CLEVELANDS"
Cut your quantities and run a greater variety of product.
The quick turn over of stock is the ideal economy.

THE CLEVELAND AUTOMATIC MACHINE CO.
CLEVELAND, O., U. S. A.

About sixteen years ago a man to whom we were trying to sell a

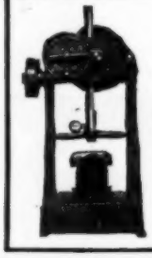
PRECISION BORING, DRILLING AND MILLING MACHINE



asked "What kind of an OLD machine does it make?" We could not answer the question because at that time there were no old machines.

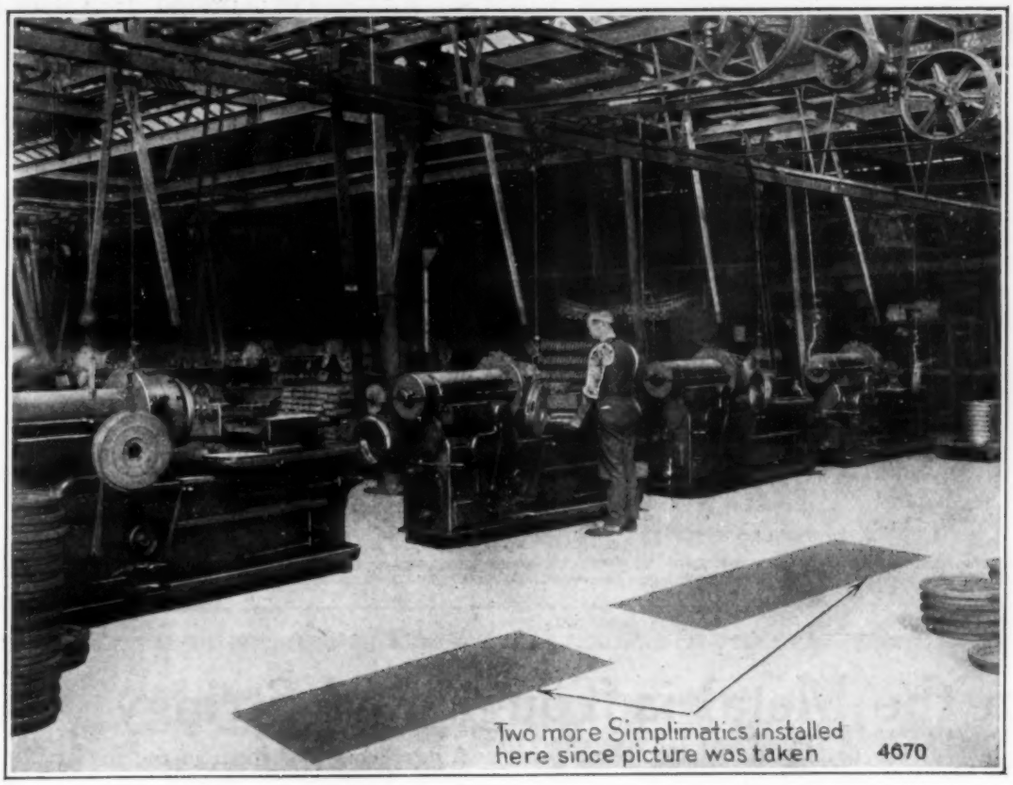
But, we can tell them—and tell the World—now, that there are plenty of them twenty years or more old, still doing good work, and for which the number of repair parts we have been called on to furnish is so small as to be negligible.

Lucas Machine Tool Co.
Cleveland, Ohio
U. S. A.



WE ALSO MAKE THE
LUCAS POWER
Forcing Press

GISHOLT



The Simplimatic Lathe

The tremendous capacity of the Simplimatic to produce huge daily runs of duplicate parts without supervision other than chucking and unchucking of the piece, will appeal at once to every manufacturer interested in improving present production methods.

The Simplimatic has the productive capacity of a specially designed machine, yet it is readily adaptable to a wide range of work such as the finishing of:

Pipe flanges	Ball bearings	Commutator caps
Bevel gears	Bearing retainers	Rotor flanges
Pistons	Transmission gears	and many other pieces

THE SIMPLIMATIC LATHE

The Simplimatic is a thoroughly tried out, highly productive lathe which meets the need of a simple automatic machine capable of taking a number of cuts simultaneously on a variety of chucking and between-centers work.

Its application to each job gives the production of a machine solely designed for that particular job, and its adaptability to different kinds of work is one of its greatest advantages.

Ninety-five Simplimatics are in daily use in twenty-five plants of twenty-two different firms. Ten of the twenty-two users have reordered. Detailed information will be sent upon your request.

Gisholt Machine Company

1000 E. Washington Ave.
Madison, Wis.

30 Church St.
New York, N. Y.

1888 Page Ave.
Cleveland, Ohio

Complete Analysis

The Examination and Diagnosis of Business

Complete Analysis in business is the same as examination and diagnosis in medicine. It is an expert study, *in detail,* of all operations in all departments of factory and office—buying, production, selling, accounting.

Analysis *proves* whether the business is sick or well. If sick, it determines the weakness or ailment, making possible the prompt application of the proper remedy.

Safe and steady progress, unrestrained by doubt or fear, is assured only when the enterprise is in a condition of *proven* health—when the executive has a clear consciousness of strength, with the safe confidence and sane courage, inspired by facts.

For many years, it has been the privilege of Ernst & Ernst, a national organization, to serve firms nationwide in this fundamental work of complete analysis.

ERNST & ERNST

AUDITS—SYSTEMS—TAX SERVICE

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ROCHESTER	CLEVELAND	AKRON	KALAMAZOO	ST. PAUL	DENVER	HOUSTON
BOSTON	CINCINNATI	CANTON	WHEELING	DAVENPORT	ATLANTA	FORT WORTH
PROVIDENCE	TOLEDO	DAYTON	ERIE	INDIANAPOLIS	SAN FRANCISCO	SAN ANTONIO
PHILADELPHIA	COLUMBUS	LOUISVILLE	CHICAGO	ST. LOUIS	LOS ANGELES	WACO

TAX OFFICE: 910 TO 918 MUNSEY BLDG., WASHINGTON, D. C.

When the Metal is Tough and Stringy

Watch a good lathe hand ease up a bit and nurse his tool through the hard spots, or grind a little different angle or choose a differently shaped bit. *He suits the tool to the job!*

Same thing with Taps—there are Butterfield High Speed Steel Taps for tough stringy drop-forgings—two and three-fluted Taps that work out mighty well on certain screw machine work—Production Taps that shear the metal and speed up output—and then we make them up to special tempers for special jobs—that's service—good old reliable Butterfield service that dates back to 1885—that dates forward your conception of Tap performance.

Tough jobs or Tapping troubles—put it up to us for solution

BUTTERFIELD THE BETTER TOOLS

Get your name in for the new catalog now on the press! New tools, new data—mighty handy to have on file.

BUTTERFIELD & CO. DIVISION

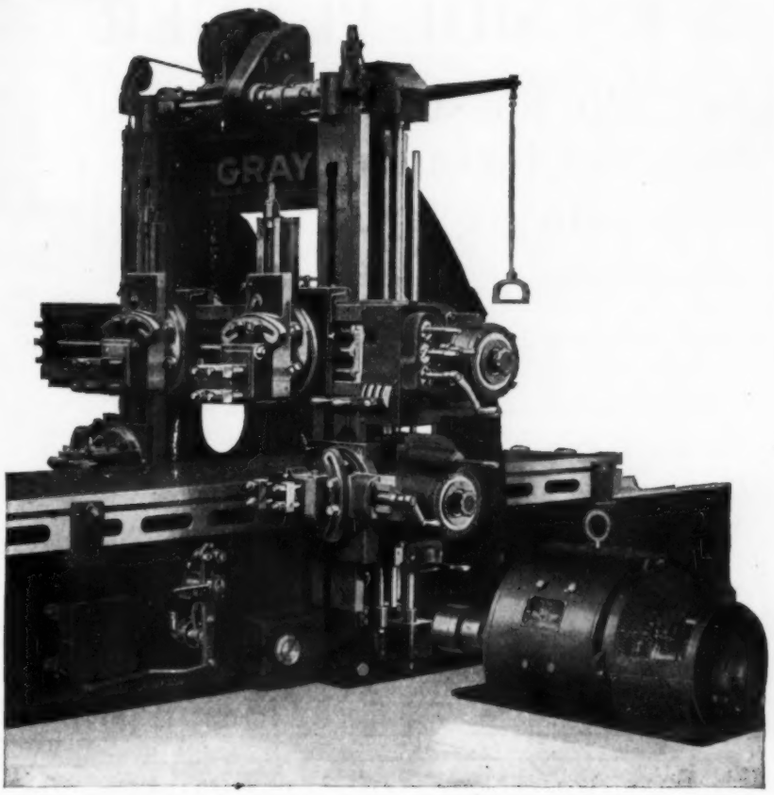
Union Twist Drill Co.

Derby Line, Vt., U. S. A. Rock Island, Quebec, Canada
Stores: New York, 62 Reade, St. Chicago, 11 So. Clinton St. Detroit, 428 Jefferson Ave. East
Toronto, 220 King St., West. Montreal, 131 St. Paul St., West

DOMESTIC REPRESENTATIVES: Pittsburgh, Somers, Fitler & Todd Co., 327 Water St., Mill Supply Co., Erie, Pa.; Philadelphia, Diamond Specialty & Supply Co., 15 N. Sixth St.; Wayne Hdw. Co., Ft. Wayne, Ind.; Indianapolis, Vonnegut Machinery Co., 19 West South St.; San Antonio Machinery & Supply Co., San Antonio, Tex.; Georgia Mill Supply Co., Albany, Ga.; Meadows-Price Co., Roanoke, Va.; Chicago, Whitehead Sales Co., 21 Clinton St.; St. Louis, St. Louis Machinists Supply Co.

FOREIGN REPRESENTATIVES: Great Britain, Geo. H. Alexander Machinery, Ltd., 83-85 Coleshill St., Birmingham, England; France, Italy, Belgium and Switzerland. R. S. Stokvis & Fils, 20 and 22 Rue des Petits Hotels, Paris, France; Sweden, Norway and Denmark. Ab. Sigfr. Anderson & Co., Malmo; Spain, Defries Sociedad Anonima Espanole, Cortes 587, Barcelona; Japan, Abe-Kobel & Co., Yokohama; Greece, Stephen C. Stephanson, 11 Lycourgan St., Athens; Netherlands, Wynmalen, Hausman, Rotterdam; Australia, Maurice Gandry c/o Arkell & Douglas, 9 Strong St., Sydney.

ZAM—



One shift of a single lever and your head is where you want it. The Gray Rapid Traverse is a *real* rapid traverse and not a mechanical joke. It is so simple and easy to operate that even an apprentice can use it with absolute confidence.

The Single-Shift Rapid Traverse is but one of the fourteen features that mark the recognized superiority of

Gray Planers

1. Single shift rapid power traverse for side-heads and rail-heads. Patented.
2. Cantslip Dial Feed; positive and instantly set. Patented.
3. Rail setter; you set the rail from the operating position. Patented.
4. Rail-lock; turning one crank locks rail to inside of housings. Patented.
5. Gray-geared for power and enduring smoothness of motion. A new type of gearing. Patented.
6. All driving gears run in oil.
7. Double-length bed. Table never overhangs.
8. Gray forced lubrication to V's with filtered oil. Patented.
9. Center-wall box table; prevents springing.
10. Forced lubrication on driving shaft bearings.
11. Oil pressure relief valve; insures uniform oiling at all speeds. Patented.
12. Centralized lubrication of other parts.
13. Complete centralized control.
14. Gray safety clutches; make the planer fool-proof.

THE G. A. GRAY CO.

Cincinnati, Ohio

CINCINNATI

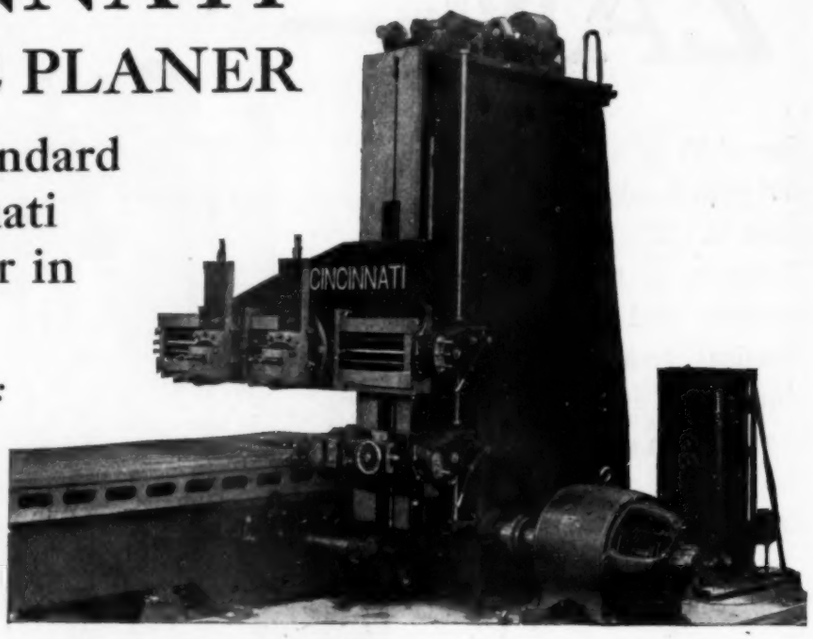
PLANERS
BORING MILLS

OPEN SIDE PLANER

Just like the standard Planers Cincinnati open side are far in advance.

Look at these features:

Rapid Traverse,
Forced Lubrication,
Herringbone Gears,
Boxtable and Arch

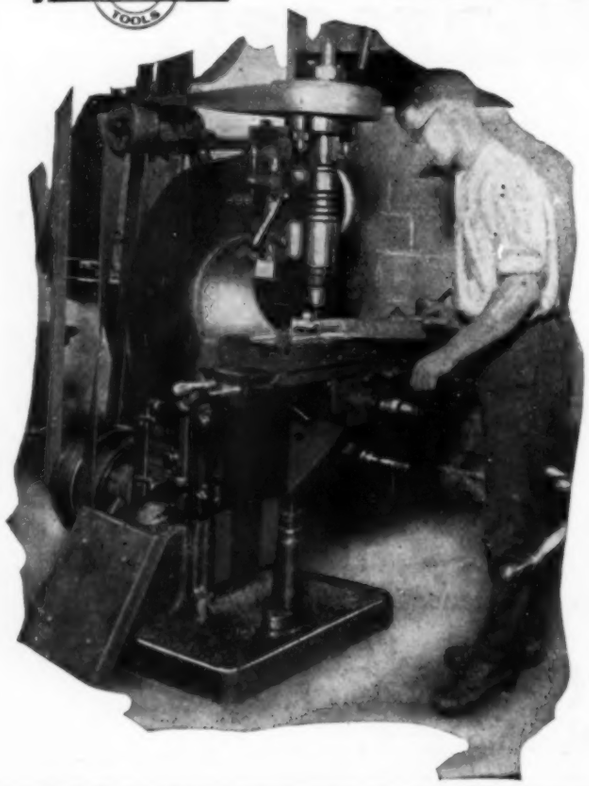


THE CINCINNATI PLANER CO.

CINCINNATI, OHIO

REED-PRENTICE MACHINE TOOLS

BECKER BELT DRIVEN MILLERS



For the making of steel moulds for rubber products BECKER Vertical Millers have proven especially adaptable due to their high spindle speeds, power, range and ease of operation.

The No. 4B shown here is one of two used for this class of work at the Columbia Rubber Mould Company. Although the work is accurate to a high degree and variety, not production, is the rule, the foreman states he finds them speedy and reliable in every particular.

May we send you particulars?

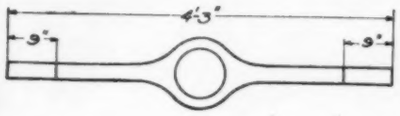
REED-PRENTICE COMPANY
MACHINE TOOLS
WORCESTER MASS. U.S.A.

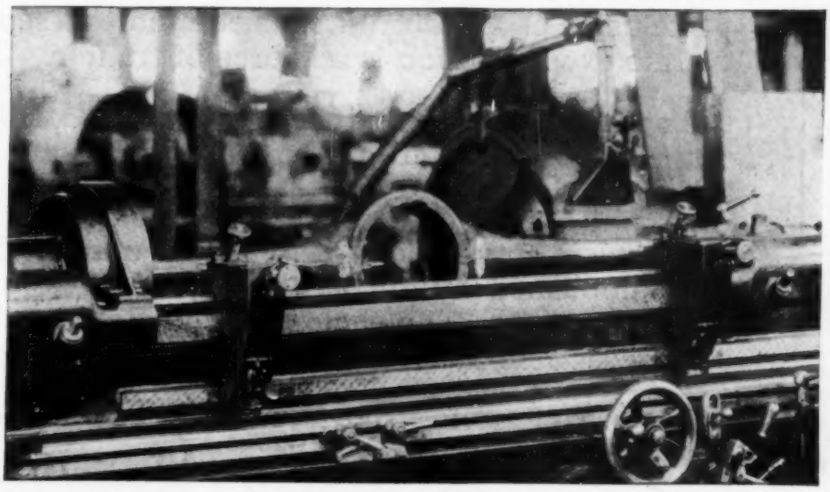
Branch Offices:
DETROIT, MICH. 6526 Gass Ave.
NEW YORK, N. Y. 149 Broadway

WIDE WHEEL GRINDING

Grinding of Rear Axle Housings on Norton Machines

One of the most profitable applications of wide wheel grinding is a common rear axle housing with a long straight bearing on each end. These are being ground on each end by the wide wheel method, 20 to 21 housings per hour, removing 1/16-in. stock to limits of .001-in. for diameter and .005-in. for roundness, without any previous turning operation.





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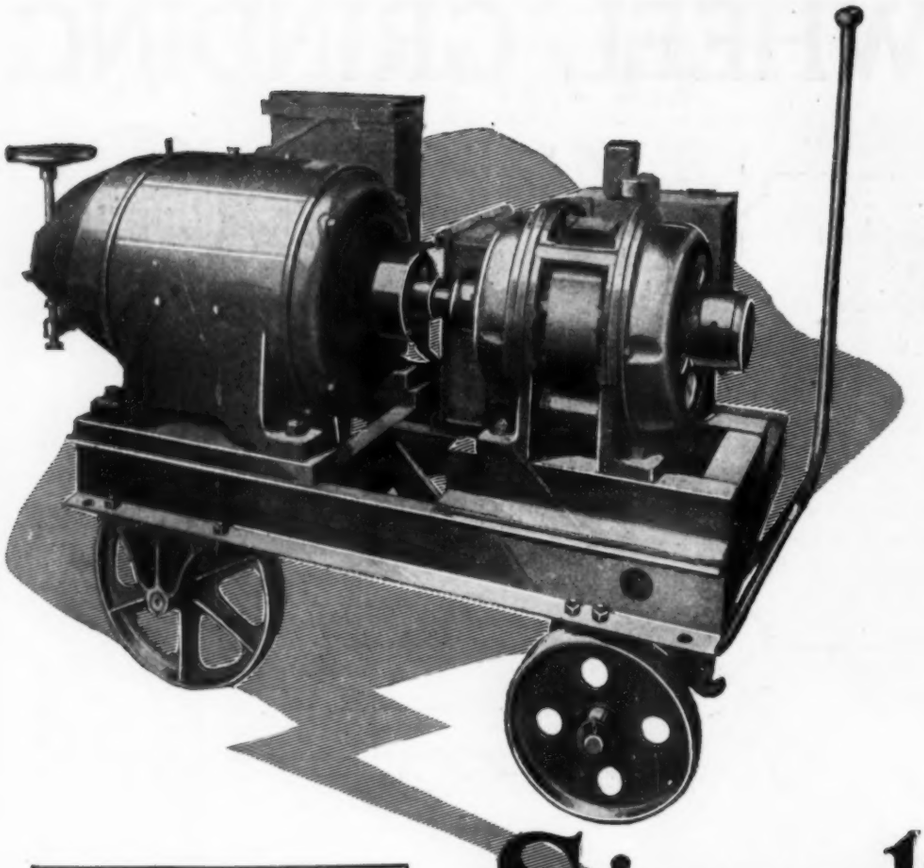

Simplicity!

—a feature of the WD-12 Arc Welder

This welder is a two-unit machine—motor and generator. The generator is ***self-excited*** (an exclusive G-E feature). This eliminates a separate exciter which is a source of trouble.

Another exclusive feature is the ***reactor.*** This automatically steadies the arc under all welding conditions.

Complete regulation of welding current is accomplished by turning the handwheel on the generator. The enclosed magnetic switch provides safe and easy starting.

The arc is easy to strike and easy to maintain—all operators like it.

Ready to work when delivered.

The
WD-12 Arc Welder

—operates on any commercial voltage, phase or frequency.
—delivers 200 amperes continuously and 300 amperes for short periods.
—voltage can be adjusted to suit work.
—any value of welding current between 75 and 300 amperes.
—all commercial sizes of electrodes, large or small.
—supplies power to G-E Automatic Arc Welder for continuous welding.

There is a suitable G-E welder for your every arc welding need. Ask the nearest G-E sales office for complete information.

General Electric Company
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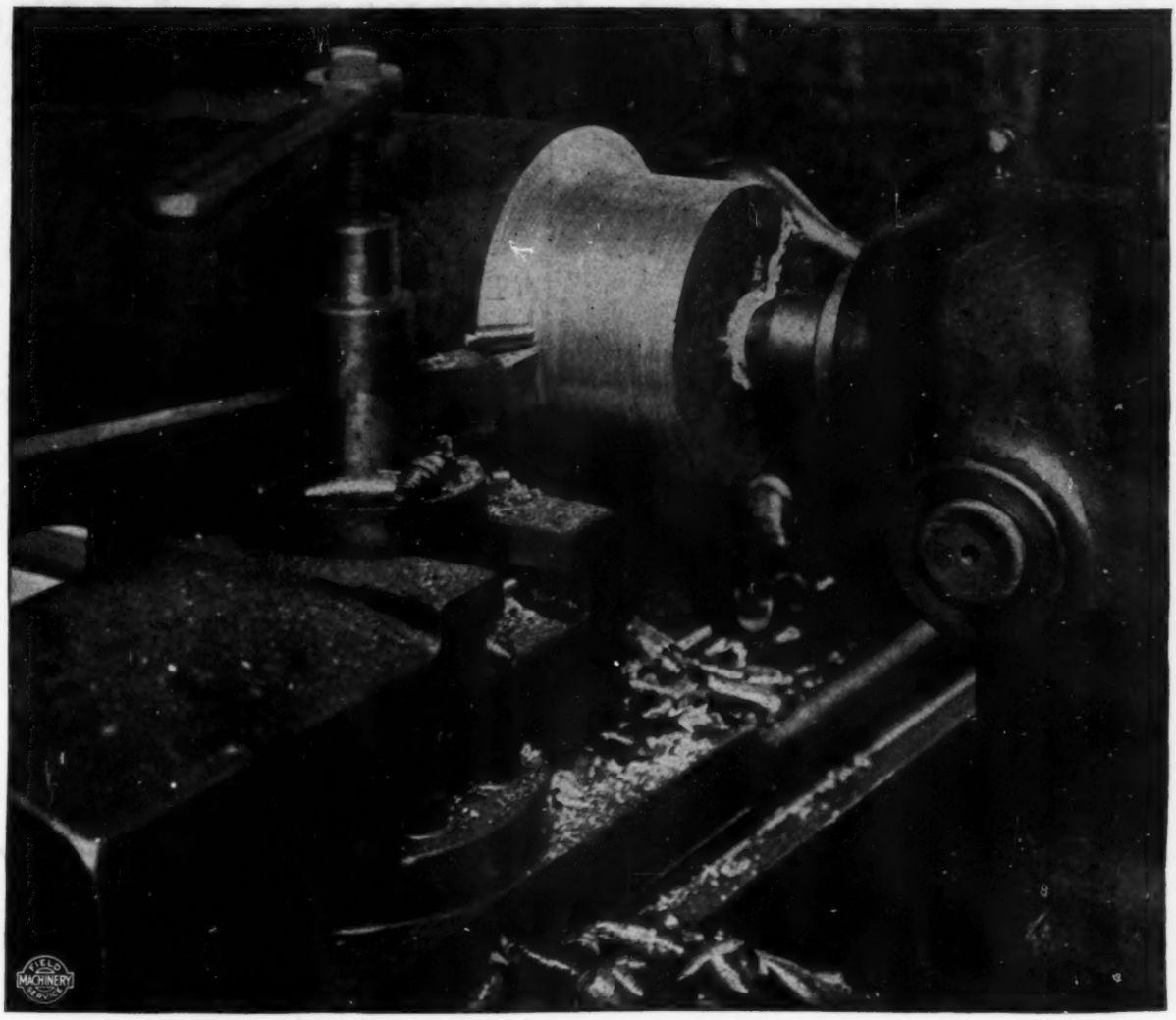
Sales Offices in all Large Cities

43B-232

GENERAL ELECTRIC



Have You a Lathe That Can Make a Cut Like This?

Do you have a 21 in. lathe in your shop that will do what this "Ryerson-Conradson Geared Head Engine Lathe is doing?" In a large railway shop the camera man caught this 21 in. R. C. Lathe making a $1\frac{1}{4}$ in. cut at a 1-16 in. feed at 32 R.P.M. in 60 carbon axle steel. The peripheral speed was approximately 36 feet per minute. The lathe removed 7 lbs., 11 oz. of steel in 7 minutes.

Special features enable the Ryerson-Conradson Lathe to make bigger cuts, smoother and more accurately. Centralized controls, quick shifting of feeds and speeds make it faster too. The facts are worth money to you. Send for Bulletin 1301.

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Established 1842

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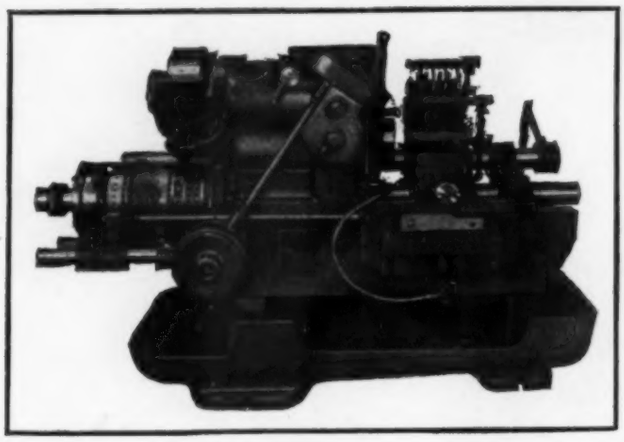
RYERSON MACHINERY

Short Bed Fay Automatic Lathe



This member of the family of *Fay Automatic Lathes* is designed *without Tailstock,* but has Standard Cams and Multiple Tool Blocks.

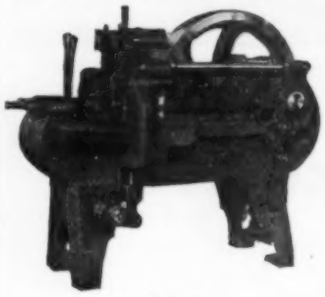
For turning, boring and facing work held in a chuck or spindle fixture up to diameter of 14¾ in. over the carriage and 11½ in. over the center bar.

There is a type and size of Fay Automatic Lathes to meet your demands for greater output

If you are paying too much per piece for producing work of various diameters, get in touch with our Engineers. They will try and set you right.

JONES & LAMSON MACHINE CO., Springfield, Vermont

One of our large line of Bolt and Cold Punched Nut Machinery



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We make a complete line of bolt and nut manufacturing machinery similar to those we use for our own large production of bolts and nuts.

We know bolt and nut manufacturing from A to Z and consequently these machines have advantages and improvements that make them particularly successful on this work.

Write today for full details of these advantages.

We also make Broaching and Key-Seating Machines

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For machining Brass, Copper, Bronze, Aluminum, Cast Iron, Chilled Iron and other metals. Maintain their sharp cutting edges for many months of continuous use, insuring exact uniformity of size and shape for large numbers of pieces. The tools are set with Diamonds of Proper Size and Strength to give Satisfactory and Economical Service.

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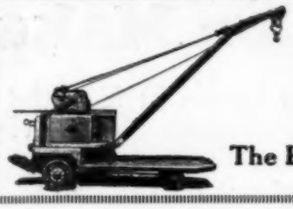
Successor to John Dickinson — Established 1796



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they make it perfectly straight, and cut absolutely accurate lengths. Pay for themselves in a few weeks.

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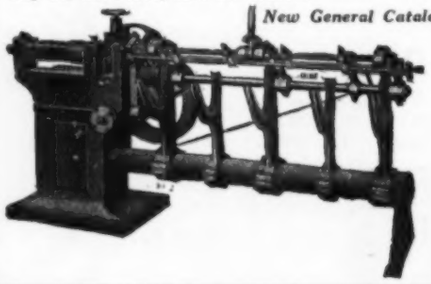

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As specialists in doing every sort of deep drawn metal work, we solicit your most difficult and intricate work of this kind.

We will assist in solving your specialized problems. Send us blueprints or samples.

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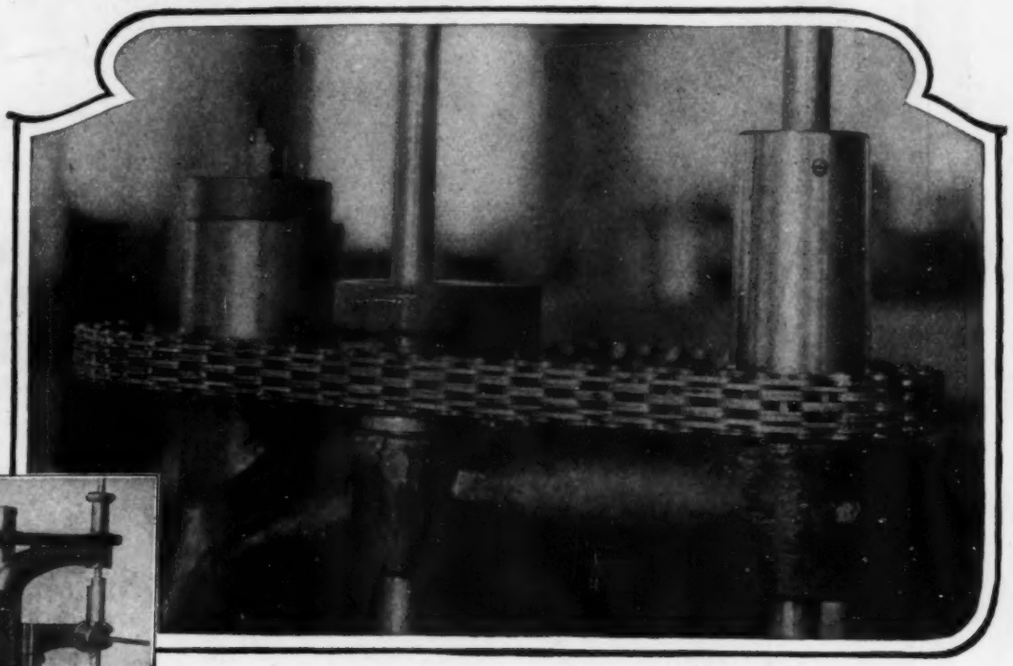
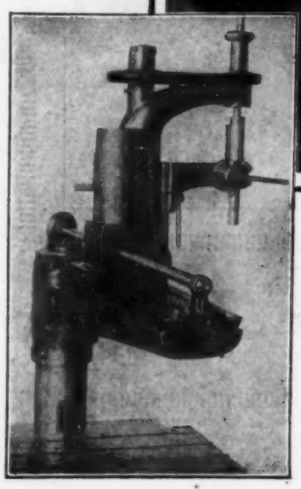
SILENT CHAIN DRIVES





Unusual horizontal "WHITNEY" Silent Chain drive on a Taylor & Fenn Co. drill press.

A perfect and noiseless chain!

The Superintendent said:—

"We consider the 'WHITNEY' Silent Chain one of the most perfect and noiseless chain drives we know of. In our long experience with 'WHITNEY' Chains we have never had occasion to change the chain due to breakage."

That's certainly enthusiastic—but he should know what he's talking about, because Taylor & Fenn have used "WHITNEY" Silent Chains for ten years on the spindle drive of their drill presses.

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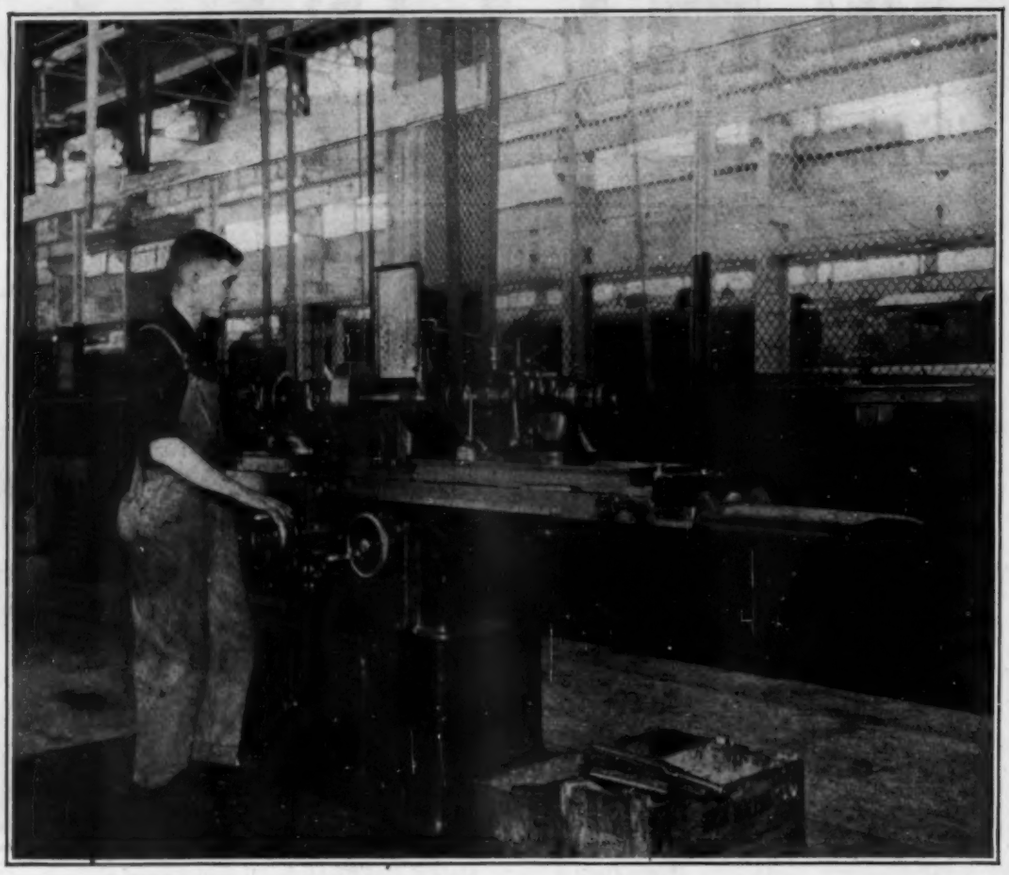

ADAPTABLE - ACCURATE - RAPID

When it comes to doing a variety of grinding operations either in the tool room or on production work, specify Brown & Sharpe Universal Grinding Machines.

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in the well equipped shop

BROWN & SHARPE
Universal
Grinding Machines

ADAPTABILITY—It's a mighty handy thing to have a grinding machine in the shop which can handle any job that comes its way. Such a machine must be adaptable and must be so constructed that it can be made ready, on short notice, to grind a wide variety of work. Brown & Sharpe Universal Grinding Machines fit these conditions exactly. Designed to do a general class of work, they not only do straight and taper grinding but handle internal and face grinding as well as sharpen cutters, reamers, etc. They can be economically used on both manufacturing and tool room work.

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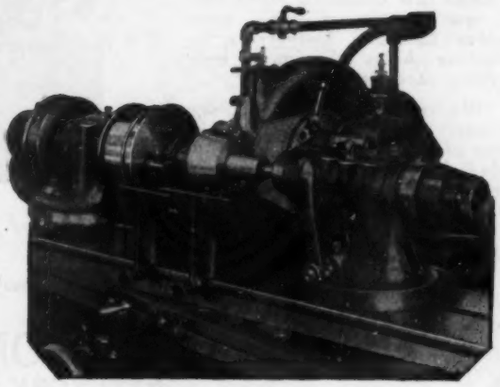
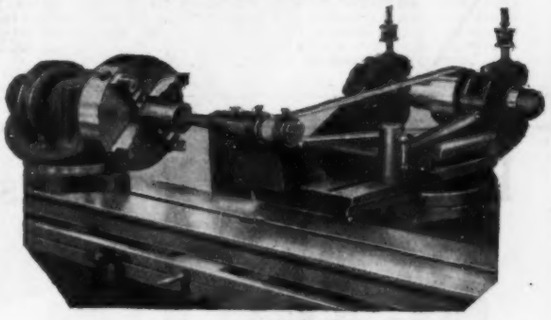
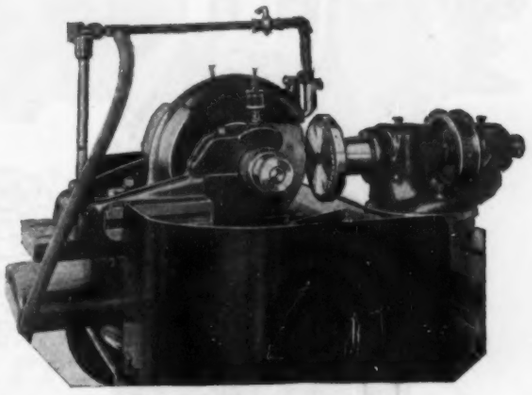


Cylindrical Grinding



Internal Grinding

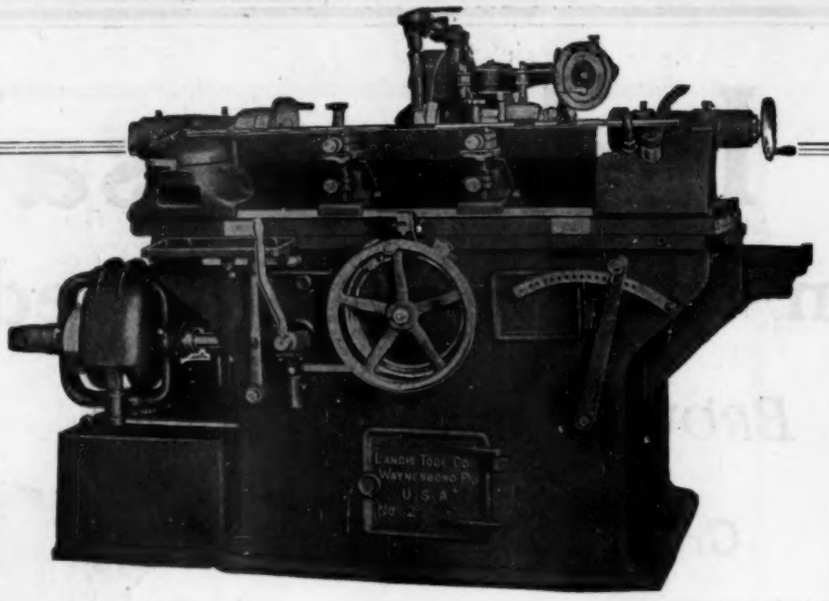


Tool and Cutter Grinding

SHARPE

LANDIS

Real Producers



Read this comment from one of our customers who uses twelve LANDIS Universals in grinding holes in inner ball bearing race ways.

"We find these machines particularly well adapted to this class of work. Rigidity as in all grinding operation, is particularly vital in the grinding of a ball bearing race way. We have found these machines entirely satisfactory in that respect."

The hole is 2.1653 inches in diameter. Number of bearings finished in nine hours, 170. Grinding time 2 minutes.

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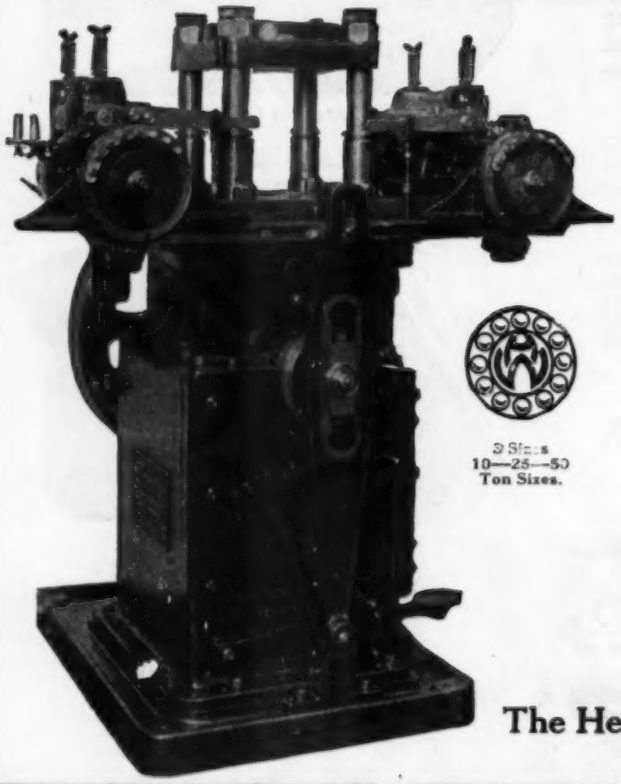
Every Punch Press user should read this catalog



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It explains fully the mechanical details of the

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It shows why all the big manufacturing units were quick to grasp the savings made possible through its unique design. Describes the automatic feed rolls that allow one operator to take care of a whole battery of Wrights—how every die becomes a sub-press die when placed on the Wright and a score of points that every Punch Press user should know.

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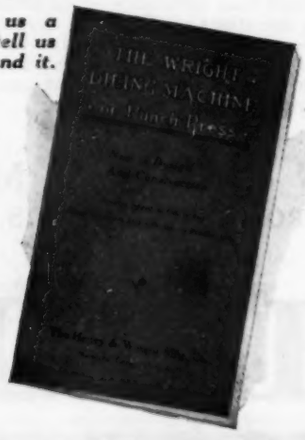

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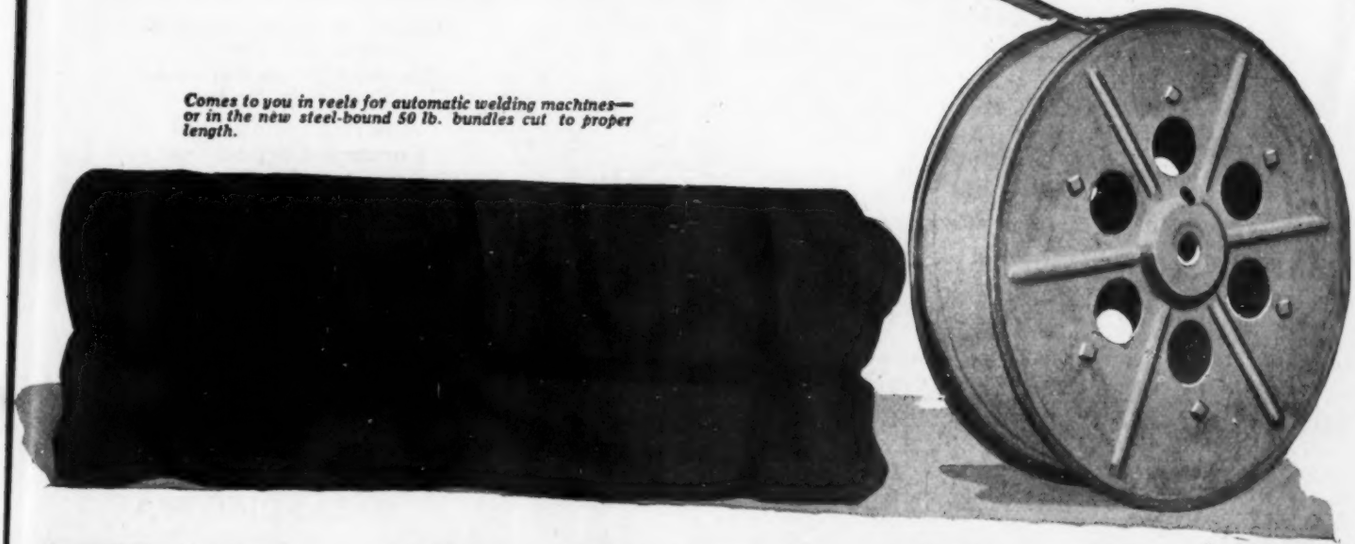

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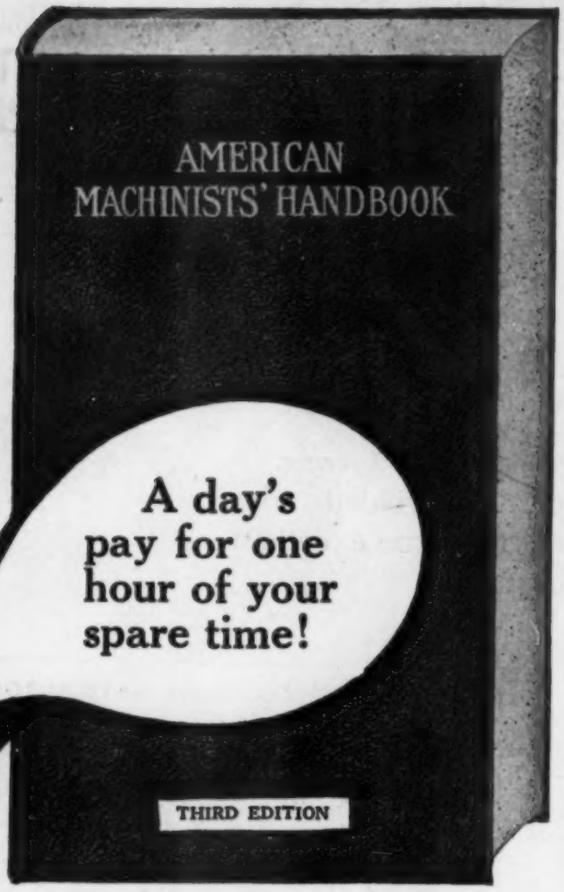

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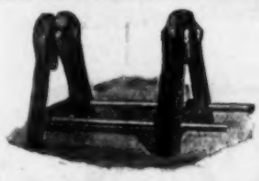

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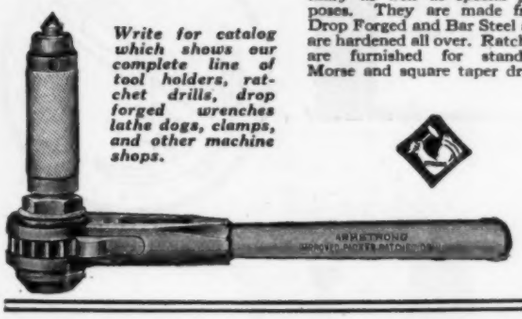
Armstrong Ratchet Drills are built in styles to meet all ordinary as well as special purposes. They are made from Drop Forged and Bar Steel and are hardened all over. Ratchets are furnished for standard Morse and square taper drills.



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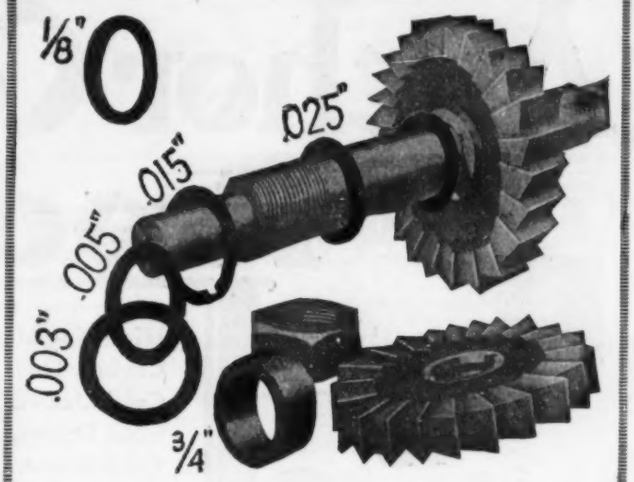
"The Tool Holder People"
315 N. Francisco Ave., Chicago, U. S. A.



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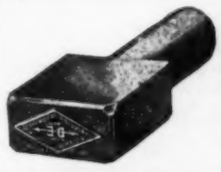

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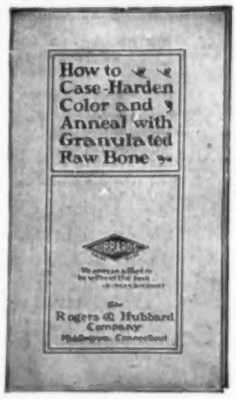

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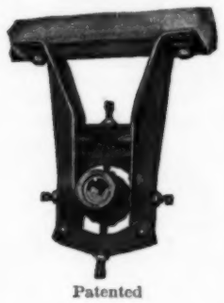

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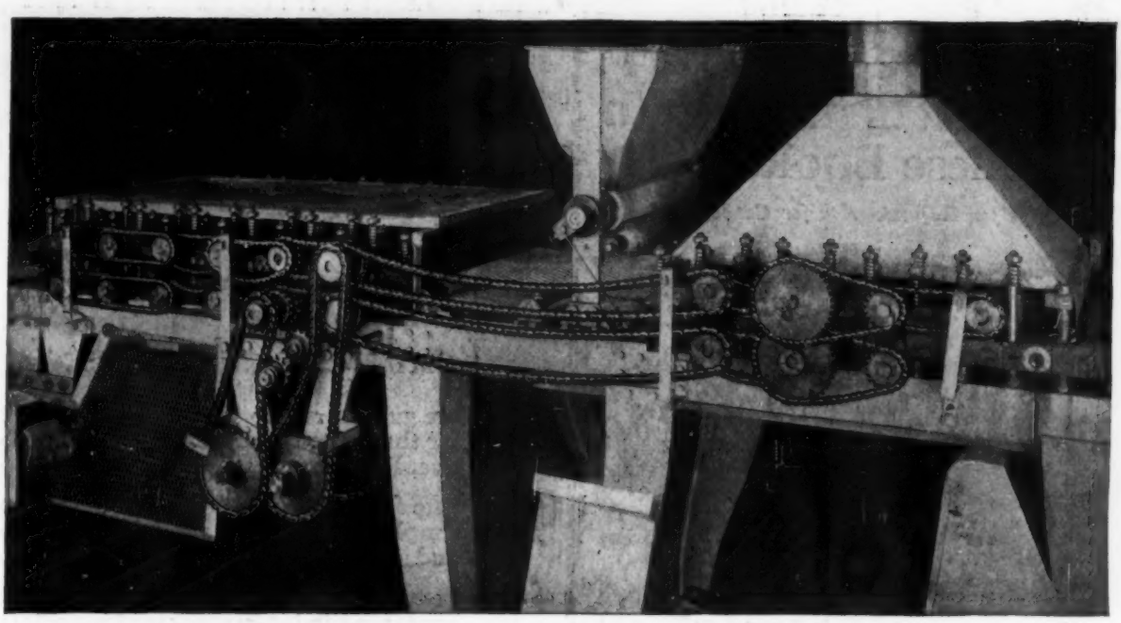

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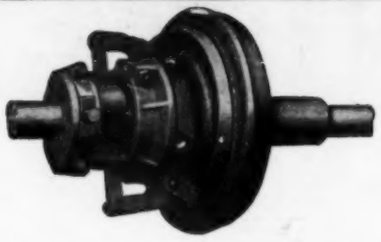

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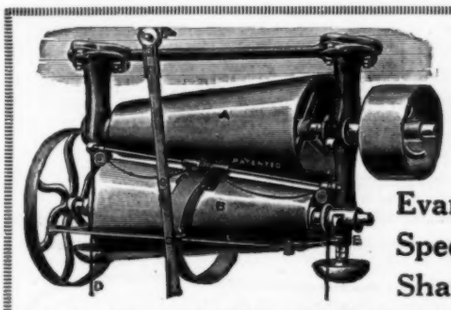

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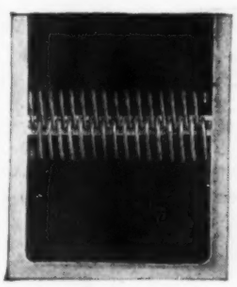

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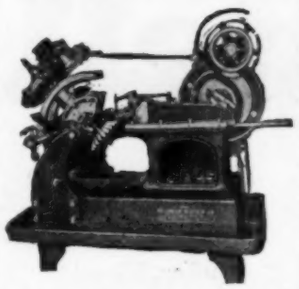

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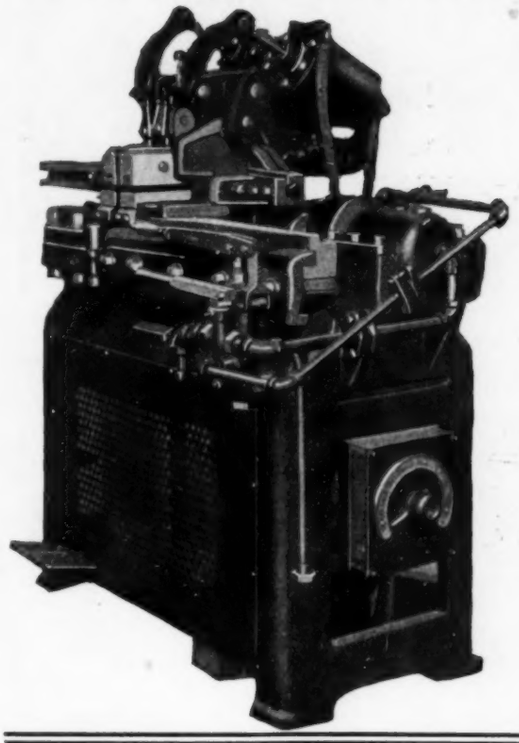

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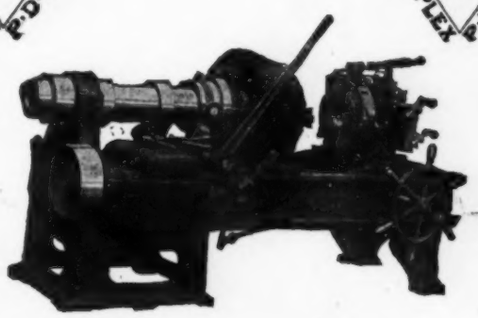

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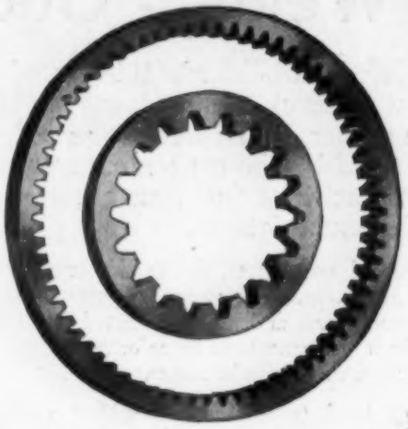

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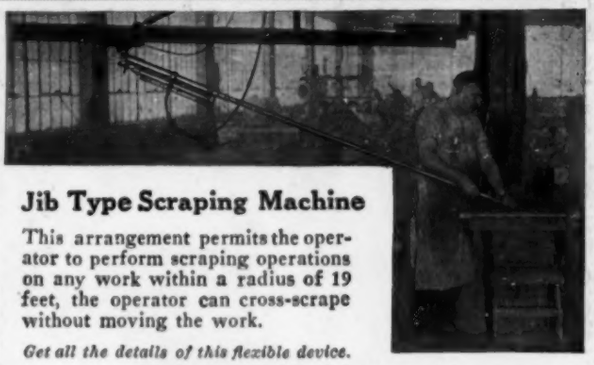

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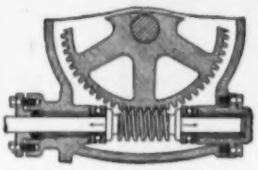

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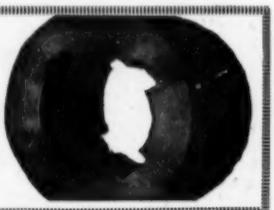

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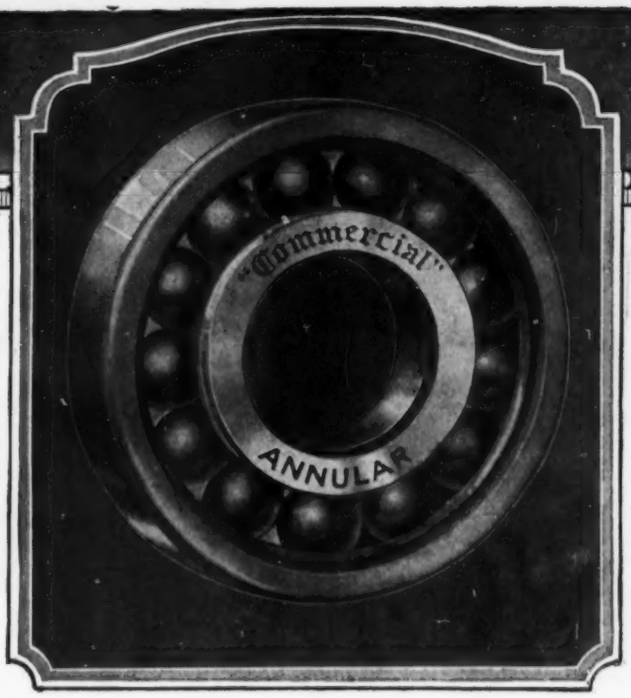

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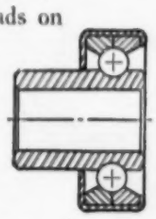

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"We never weary of well doing"

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There's a heap of satisfaction in doing a job so well that comebacks in the form of praise are received after its delivery. We get lots of such comebacks because it is the rule in our plants to "do everything better than expected."

Our experience in the gear-making field has taught us that only the *best* is *good enough*. It costs us more to live up to this policy, but our efforts are balanced by repeat orders from regular customers.

Phillie Gears, regardless of type, size of materials, habitually give unparalleled service.

Our Micarta Gears and Pinions—with or without binding plates—are lasting, silent and smooth running. We can furnish ordinary sizes within 24 hours of order.

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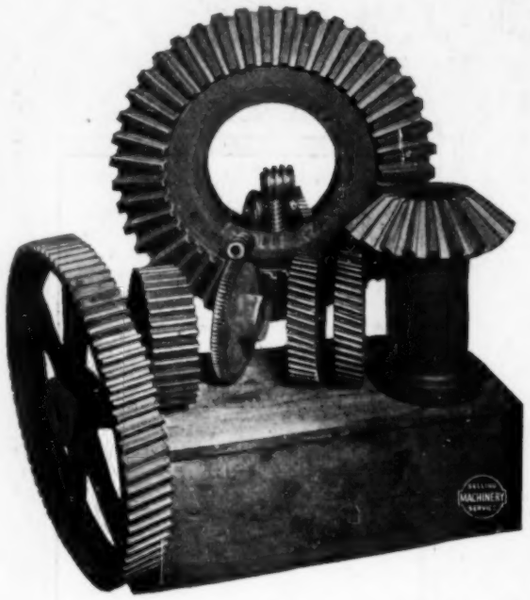

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We have an Engineering Service that will assist you to get the best results from your gears. Estimates furnished on request.

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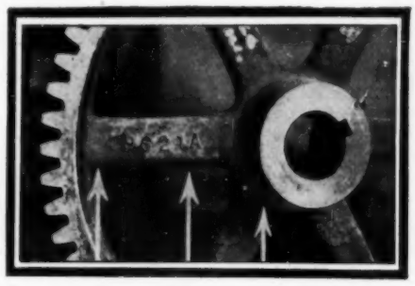

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16,000 Gear Patterns

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The extensive and well-stocked Meachem pattern racks are one of your assurances of speedy and economical gear service. The 16,000 patterns contained in them are the result of over 36 years of gear-making experience and include every standard gear type and size which this long experience has shown is likely to be needed in a hurry.

It will pay you to remember and use Meachem Gear Service for emergencies. And in the meantime, get acquainted with the Meachem high gear quality, uniform courtesy to customers, and exceptionally reasonable prices. Send us a trial order, or let us quote on some of your gear requirements. 146

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Sole manufacturers of *new process* RAWHIDE GEARS and PINIONS. Still made under the direction of the inventors and the men responsible for every stage in their development.

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"QUALITY CUT GEARS"

THERE'S a Ganschow Gear for every service—and for *every* service, Ganschow Gears are best. ¶ We manufacture all kinds of cut gears of any sort of material, and can point to 54 years of manufacturing as evidence of our consistent quality.

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Gears that are correctly cut run smooth and silent. They also consume less power.

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Made in every type, any size from any required material.

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will increase the efficiency of your machines by giving them the best in transmission.

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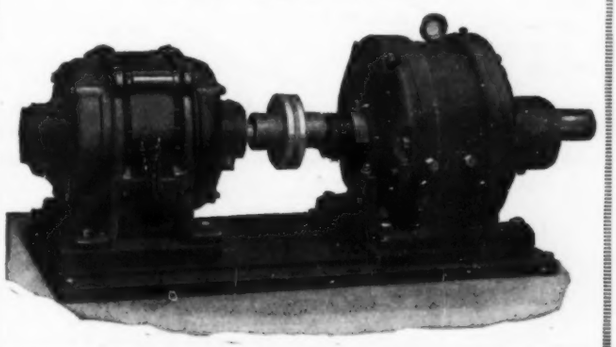

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Meeco Coolers

will insure comfort for your workers and keep production normal.

Let us send you proof of the economy of MEECO COOLERS for your plant.

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Scientifically Correct Design PLUS Painstaking Workmanship.

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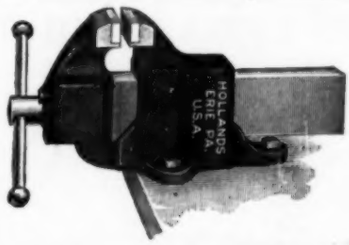

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ENGINEERS FOUNDERS MACHINISTS MILLWRIGHTS
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When Common Worm Gearing Fails
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SPEED REDUCERS
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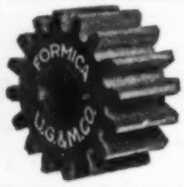

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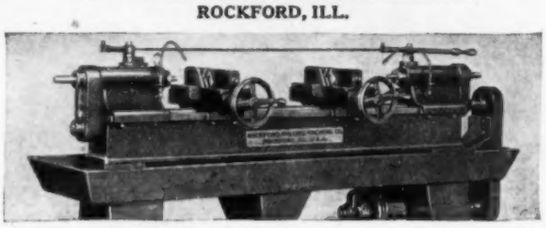

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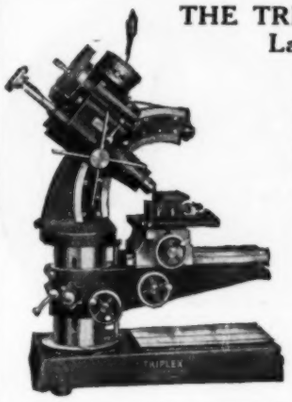

Three of the most widely used machine tools incorporated in one compact motor-driven unit. Mills and Drills to angle up to 90°. Turning, Thread Cutting and Taper Turning to the closest of precision standards.

A space-saving time-saver for both Toolroom and Production Work. Highest award from two expositions.

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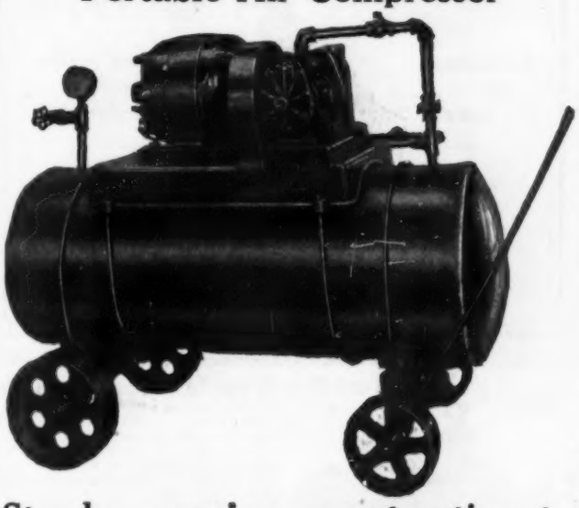
The DUNNING
Portable Air Compressor



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A minimum of sturdy one-piece castings with the elimination of piston pins, short crank bearings, connecting rods and short pistons. Every part doing its full share of the work—every part fully equal to its task.

That's the sound basis of Dunning design which makes for essential reliable, low-cost service day in and day out. Automatic forced feed lubrication, bronze bearings and ample valves.

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Nibbling Machine

Cuts any design in sheet metal up to 3/8 in. thickness at the average rate of 24 in. per minute—*internal* as well as *external*.

Invaluable in cutting templets, stripper plates, profile and snap gauges, core box and pattern plates, cam blanks, ornamental work.

Send for full particulars or forward print of your work—we'll give you Campbell time on it.

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An Associate Company of The American Chain Co., Inc.
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Patented July 4, 1922

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Our line embraces an almost endless number of combinations designed to meet the varied requirements of hydraulic systems.

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AIR COMPRESSORS, all types

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World's Largest Manufacturers

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Emergency repairs day and night—call

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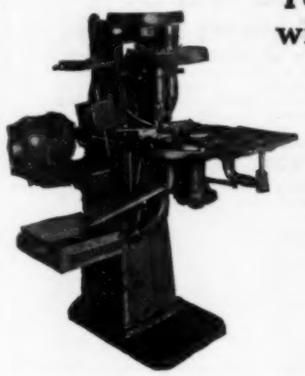

Too much coal will stifle a fire—

and in the same way it is true that too many different operations must cut down the output of screw machines. You can increase the output of the latter as much as 50% by turning over the light tapping countersinking and burring to an Anderson. This machine will run 56 strokes a minute tapping 1, 2 or 3 holes at each passing.

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Anderson Dial Feed Tapper

Anderson Die Machine Co.
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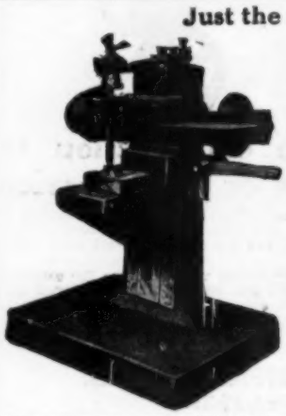
Just the thing for small riveting



This rotating vibratory riveter is a light bench model that will speed up your production on small riveting up to ⅛ in. diameter. Easily operated by an apprentice or the most inexperienced female labor.

GRANT Riveters

are manufactured in many styles. There are **Noiseless Spinning Riveters, Multiple Spindle Riveters, Pneumatic Riveters,** and many other designs. Complete details are outlined in "Perfect Riveting." Send for your copy today.

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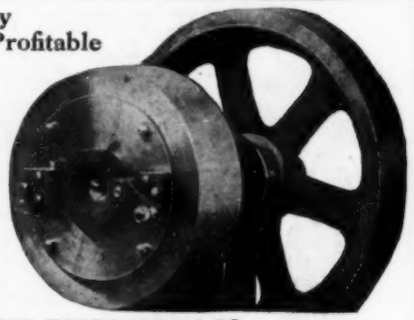
The Best Way Is the Most Profitable

If your job can be swaged, the **Dayton** can swage it better.
For variety swaging the **Dayton Swaging Machine** is unexcelled.
The Dayton Way of Swaging makes your product solid, tough and elastic. It delivers from 2,000 to 6,000 blows per minute. Choose the one that suits your needs.



Get full details. THE TORRINGTON CO.
Excelsior Plant—Successor to Excelsior Needle Company
56 Field Street, Torrington, Conn.
Coventry Swaging Co., Ltd., White Friars Lane, Coventry, England, Agents for Great Britain. Fenwick Freres & Co., 8 Rue de Bocroy, Paris, France, Italy, Belgium, Spain, Portugal and Switzerland.

Hardened steel parts need GIANT keyseating

The cutting of keyways in hubs and other parts made of hardened steel or similar tough metals, is particularly a job for the GIANT Keyseater. The cutter has a perfectly solid support, during the whole length of its stroke, which entirely eliminates any possibility of spring. Automatic relief on the upstroke prevents drag. This is one aspect of the GIANT'S superiority; the full details will be found in our catalog. Write for it.

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Have the advantage of being the sole machine tool product of an organization of specialists. They possess correct design, unusual accuracy and are easy to operate. We make 14 in. Single Geared, 16 in., 20 in., 24-26 in. and 32 in. Back Geared Shapers. **Write for a Catalog.**

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MAKE PROFITS

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PLANETARY
THREAD MILLER

For milling the largest threads on a production basis.

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SHAPERS

simply designed but accurate and efficient

12-in. to 32-in. stroke (inclusive)

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This type of keyseater is designed to meet the requirements found in shops where any keyseating is required.

It is equipped with automatic feed, which is so designed that it relieves the cutter on the upward stroke, and can be set to cut keyways of required depth. No further adjustment required to cut similar keyways in other hubs. Cutter feeds up to the work. Machine runs as easily on large jobs as on small.

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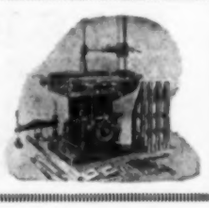

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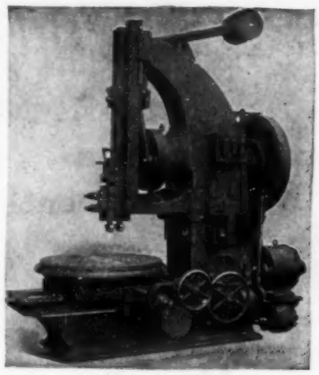

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Bar driven by variable crank with quick return. Length of stroke and bearing for bar adjustable to suit height of work. Automatic rotary, cross and longitudinal feeds, also easy hand adjustment. Operating rods and controlling apparatus grouped for convenient manipulation. Designed and constructed to meet the most exacting requirements of modern shop practice (like all other Sellers tools), thus insuring

Accuracy—Maximum Output—Durability

SHAFTING—LABOR-SAVING MACHINE TOOLS—INJECTORS

Increase your production with the

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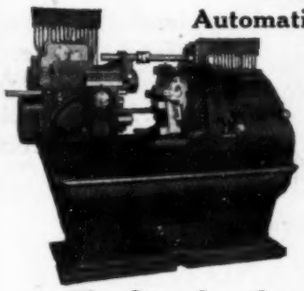

There are many refinements of design that give speed with accuracy.

For instance, several tools may cut simultaneously. Micrometer adjustments. insure accuracy.

Get our interesting booklet for complete details.

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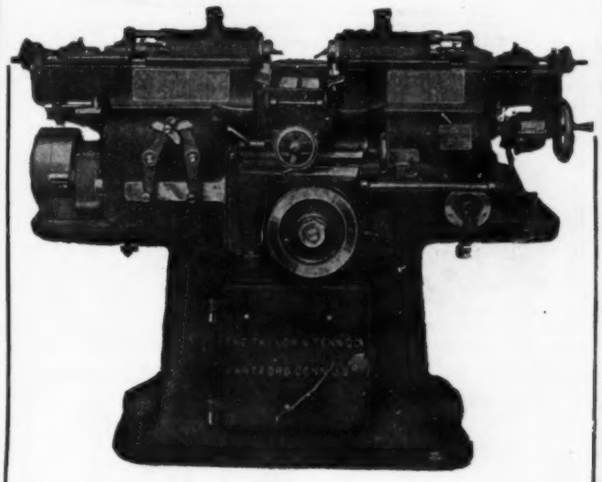

For splines with closed ends, keyways, through slots, circular, spiral and irregular grooves.

This machine has many new and valuable features, which are described in our circular.

Your request brings a copy.

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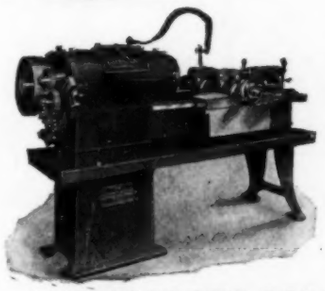

Cuts any style thread —single—double—material — up to 14-inch diameter. Full automatic operation assures speed and accuracy. No time out to grind tools.

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5-Spindle

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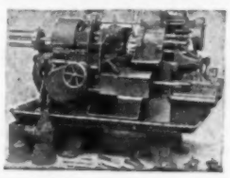

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High Duty Shapers and

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Manufacturers of

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For screw machine economy, accuracy and big output

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Our Customers Wrote this Ad.

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Master Motors are the coolest running motors we have ever used. Although often subjected to severe operating conditions, they are giving very good service.

We are much pleased with the service you are giving us and find that your motors do our work better than any motor we ever had on our compressors.

We have tried out your motors as well as other motors and have decided as a result of our tests to use Masters on our pneumatic pumps.

Wouldn't you like to test a Master Motor on your product? We'll gladly send them to responsible manufacturers. Write us about it today

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MASTER 40° GUARANTEED MOTORS

Strand

Type M P 5

¼-hp. Motor

Originators and Manufacturers

We Make Flexible Shafts and Equipments in Several Sizes and for Many Purposes

This Type MP5 is a splendid outfit for the Metal Pattern Maker and for general use in the Machine Shop or Tool Room.

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N. A. STRAND & CO.

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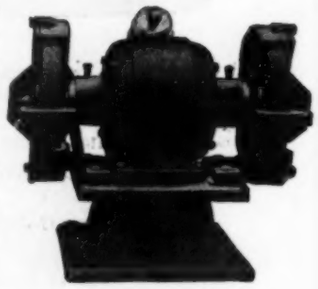
A "Glove Fit" to Your Work!

The wide range of sizes and types in which Blount Grinders are made enables you to get just the right machine. What is more, it will be also the right quality and the right price.



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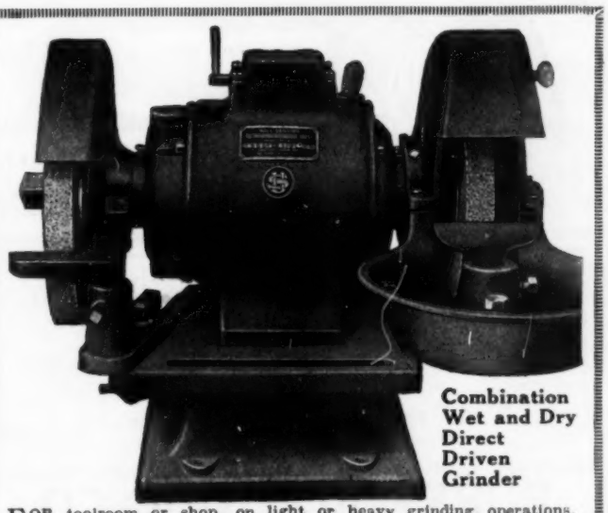

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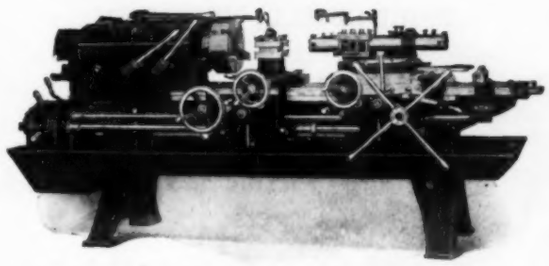

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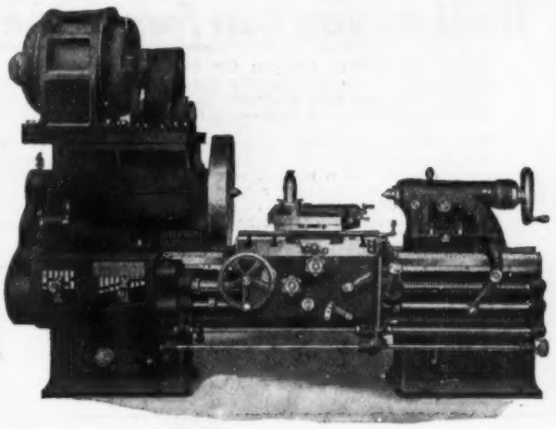

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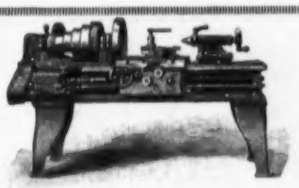

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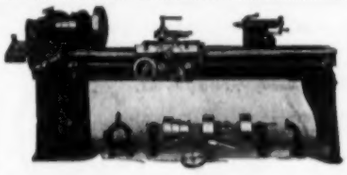

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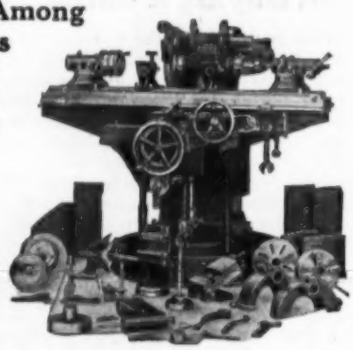

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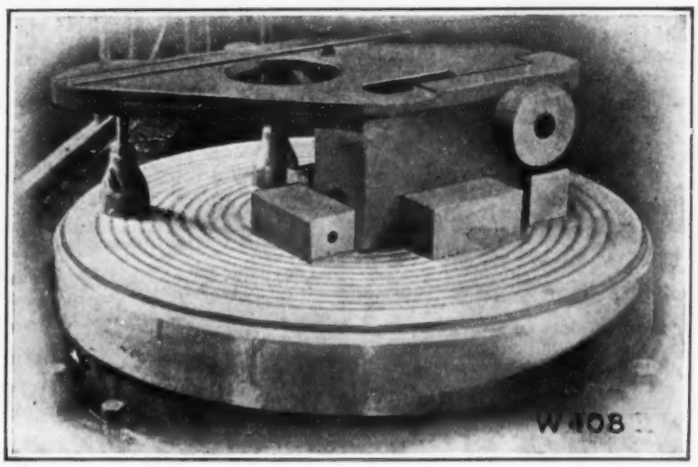

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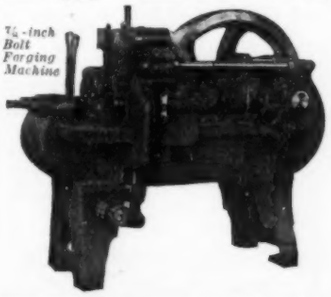

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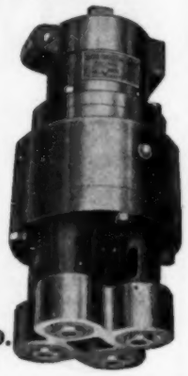

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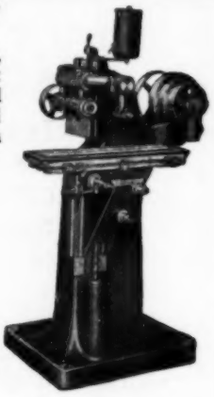

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BUILT IN FOUR DIFFERENT SIZES
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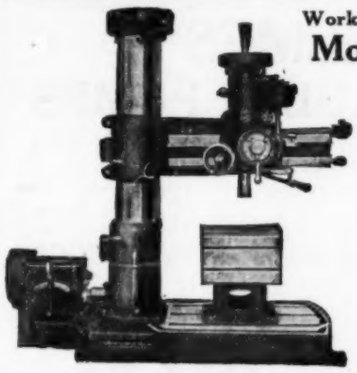

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They're real time-savers.

Sizes range from 2 to 4½ ft.

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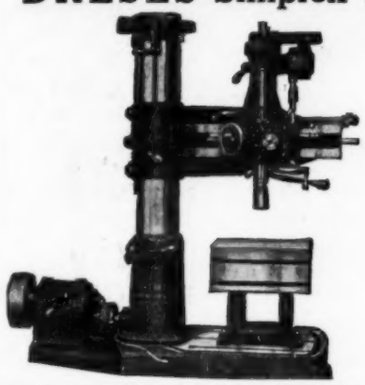

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Built in 20 and 25 in. sizes.

Better Every Year—

For 69 Years!

Surely we must have learned how to build good drills, when we have done nothing else for two-thirds of a century. Find out the latest drill practice by writing for our catalog today.

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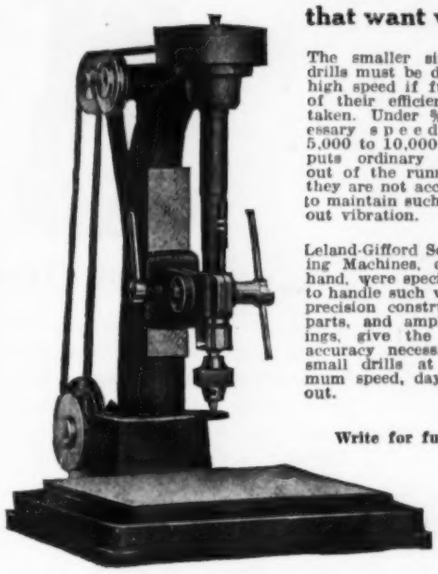
Established 1854

Leland-Gifford
Sensitive
Drilling Machines

It's the little drills that want watching



The smaller sizes of twist drills must be driven at very high speed if full advantage of their efficiency is to be taken. Under ⅝ in. the necessary speeds run from 5,000 to 10,000 r.p.m. That puts ordinary drill presses out of the running, because they are not accurate enough to maintain such speeds without vibration.

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Upright Drills

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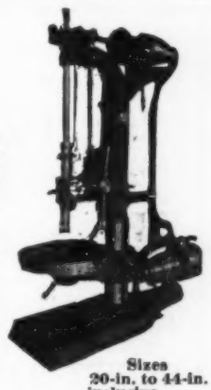

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High Speed Ball Bearing Sensitive Drills and Heavy Duty Radials

Advanced design and high grade construction make them the logical tools to use for efficient, low cost production. Investigate.

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Speed up with **HŒFER** **Drilling Machines**

Their "minute-saving" features of design will greatly increase your drilling output and profits. Get the complete details from our branches in the principal cities.

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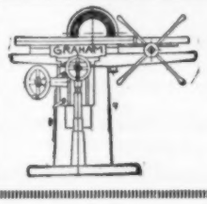
FREEPORT, ILL.



GRAHAM GRINDERS
KNEE TYPE—RING WHEEL
for Flat Surfaces
NEW PULLEY GRINDER
For finishing pulleys, shallow circular and curved work.

The GRAHAM MFG. CO.
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How Do Your Stampings Behave?

Do they curl up, roll over —require hand finishing —filing—flattening and the host of other things that mark the product of ordinary dies?

WALTHAM Sub-Press Dies

with positive alignment at all times, permit the closest fit between punch and die—deliver the most accurate, clean-cut stampings, free from ragged edges, distortion, and ready for assembling—no fixin' up necessary, and, best of all, are free from danger of damage through careless or inexperienced operators.

We will gladly mail you complete information regarding our sub-press, compound and other types of dies.

WALTHAM MACHINE CO.
High St., Waltham, Mass.

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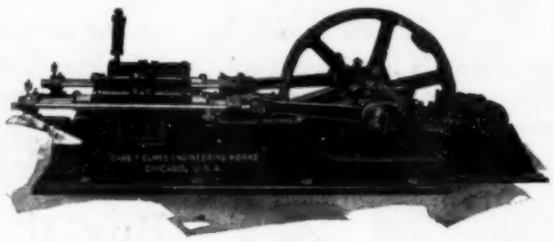
HYDRAULIC PUMPS

From Generation to Generation
WORK SIDE BY SIDE
WHERE THE MOST SEVERE
CONTINUOUS HIGH DUTY SERVICE
IS IN DEMAND



Design No. 1722—8-in. and 12-in. stroke—heavy one piece engine type bed plate. Ground tool steel wrist pins. Forged steel pressure cylinders. One piece steel forged crank shafts. Nickel steel valves. Monel metal seats. Solid end type connecting rods. Genuine babbitt used throughout.

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PATTERN MILLER

The "OLIVER" is to the pattern shop what the universal milling machine is to the tool room.

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Sheet Metal Working Machines and Tools

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Established 1879
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Hydraulic Presses and Valves, Power Pumps and Accumulators
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25 years' experience building hydraulic equipment.

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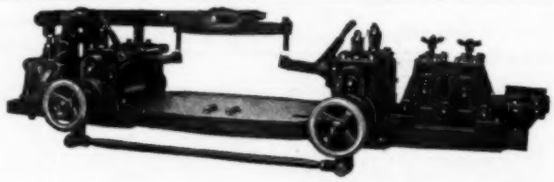

LITTELL
Automatic
PUNCH PRESS FEEDS

The illustration shows the complete Littell oiling—straightening—feeding—punching—waste cut-off unit ready to attach to punch press. This device converts an ordinary punch press into an automatic machine and multiplies its output many times. You need it in your shop. **Write**

F. J. Littell Machine Co.
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Formerly Acme Machine Works

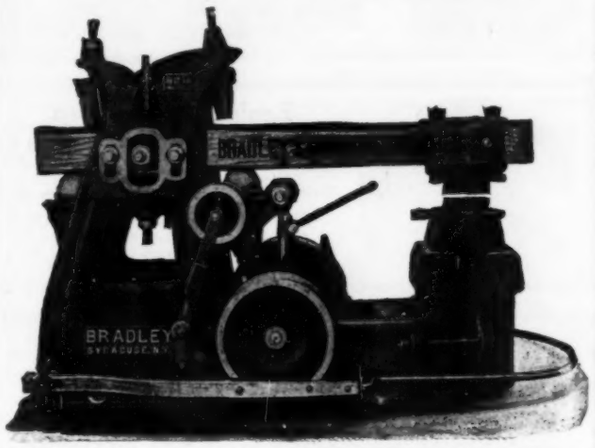
Adjustable anvil block means accuracy It's a feature of all Bradleys

The adjustable anvil block, which features in every Bradley Hammer, is a distinct component, quite separate from the main frame to which it is bolted. By inserting a packing of wood or fibre between these two, it is possible to obtain perfect die alignment without difficulty.

We make many sizes and styles of power hammers, each designed for a specific purpose, and there is one which will handle your particular work well. We offer our long experience to aid in the choice.

Write Us Your Requirements

Bradley Cushioned Helve Hammer



C. C. Bradley & Son, Inc., Syracuse, N. Y.

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"TOLEDO"
PUNCHING PRESSES

THE "TOLEDO" Punching Presses are especially suited for punching, shearing and cutting out blanks of heavy metal—steel, iron, brass, etc.; for operating trimming and forming dies used in the manufacture of automobiles, motorcycles, bicycles, cutlery, sewing machines, typewriter parts, agricultural implements, etc., switchboard parts and numerous other articles formed from bar and sheet metal.

"Toledo" Punching Press, No. 34-P

"PRESSES FOR EVERY PURPOSE"

Estimates furnished—correspondence solicited

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Toledo, Ohio

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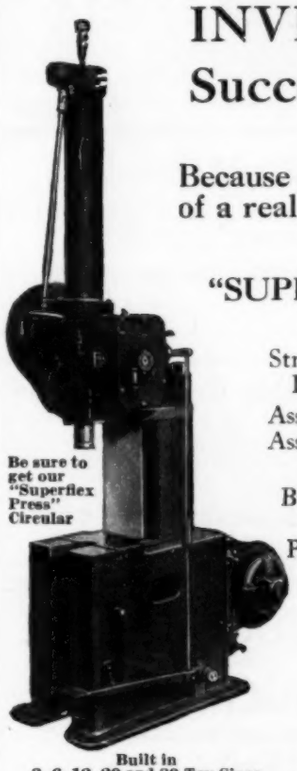
MACHINERY IS A REAL INVESTMENT

Success Follows

WHY?

Because it is the foundation of a real future.



Be sure to get our "Superflex Press" Circular

FOX
"SUPERFLEX" Press

MANY USES:

Straightening Shafts of All Descriptions. Bending.
Assembling Rear Axle Parts.
Assembling Gears to Shafts.
Forming.
Burnishing Holes to Size.
Heading Rivets Cold.
Pressing in Bushings and Bearings.

12-Ton Capacity

From 1 lb. to 30 tons pressure can be applied at will.

Built in 3, 6, 12, 20 and 30 Ton Sizes

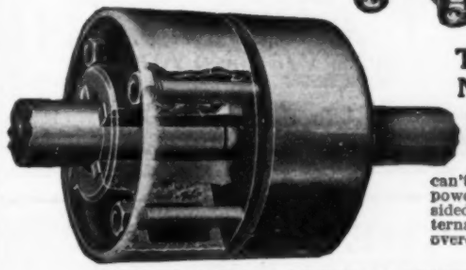
FOX
MACHINE CO.
Jackson, Mich.

NICHOLSON TOOLS

A Thousand and One Holes—

either round or square—any diameter from 1 inch to 7 inches, easily fitted if you have a set of 9 Nicholson Expanding Mandrels.

They are quickly adjustable, and built to stand the heaviest service. Think of the economy of having 9 Nicholson Mandrels replace the dozens of solid mandrels—plus the time saved in turning up new ones for every job that comes along.



The Nicholson Shaft Coupling

can't shear off—powerful four-sided grip—no internal friction to overcome.

Any sized shaft from 1-3/16-in. to 6-15/16-in.

Our Catalog explains full details—want a copy?

W. H. NICHOLSON & CO.
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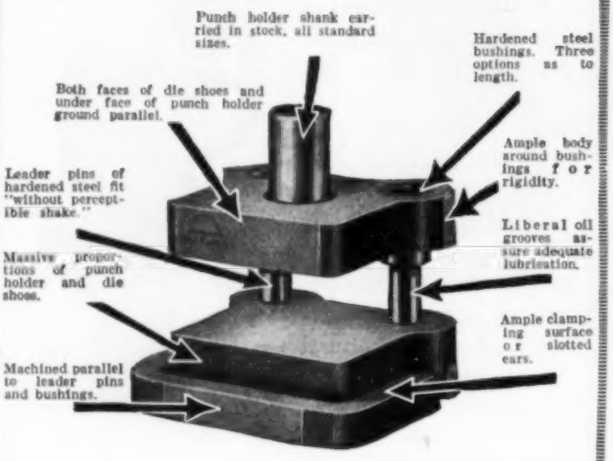
What Do These Mean in Your Shop?


Punch holder shank carried in stock, all standard sizes.
Hardened steel bushings. Three options as to length.
Both faces of die shoes and under face of punch holder ground parallel.
Ample body around bushings for rigidity.
Leader pins of hardened steel fit "without perceptible shake."
Liberal oil grooves assure adequate lubrication.
Massive proportions of punch holder and die shoes.
Ample clamping surface or slotted ears.
Machined parallel to leader pins and bushings.

Send for Catalog and Prices

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SAWS FOR METAL CUTTING

Inserted Tootn; Solid Tooth; Milling; Hot
Pneumatic Hammer Rivet Sets and Chisel Blanks

Hardened Steel Specialties
Send for our latest catalog.

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Saw & Machine Co.
57th and Butler St.
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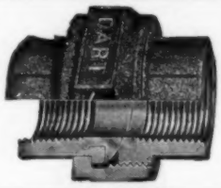

Leak-Proof Unions

Dart Unions are fitted with non-corrosive bronze seats. A free sample on request.
Write for catalog and price list No. 20.
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and THREAD ROLLING MACHINES
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THE CLEVELAND KNIFE & FORGE CO.
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HUNDREDS OF SIZES AND STYLES
FOR CUTTING, FORMING, PUNCHING, DRAWING AND EMBOSSING BAR AND SHEET METALS, PAPER, LEATHER ETC.
FERRACUTE MACHINE CO., BRIDGETON, N. JERSEY, U.S.A.

PRESSES and SHEARS

Sheet Metal Working Machinery

THE D. H. STOLL CO., Inc.
Military Road and Lancing St., Buffalo, N. Y.

The World's Standard

PRESSES, DIES AND SHEET-METAL WORKING EQUIPMENT

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COLT AUTOSAN
Metal Parts Washing Machine

More correctly cleaned parts per hour at less cost per part. Large capacity, automatic operation. Minimum overhead and supervision costs. Send for your copy of illustrated, descriptive Circular.
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Sturdy Portable Key-Way Cutter

Pays for itself on a single job. Clamps to shaft, cuts standard, accurate key-ways from ¾ in. to 2 in. in width and 12 in. in length without resetting, on shafting 1¼ in. to 8 in. Made in two sizes. Also motor-driven models. Get literature and prices.

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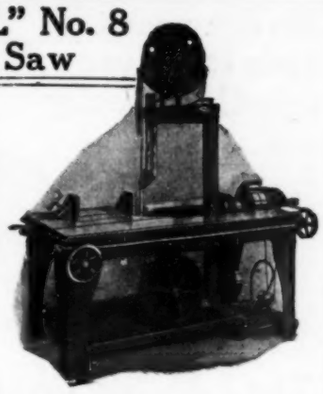
East Liverpool, Ohio

THE LONG AND ALLSTATTER CO.
POWER PUNCHING & SHEARING MACHINERY
HAMILTON, OHIO, U.S.A.
AMERICAN PUNCH & SHEAR WORKS ... THE QUALITY LINE

The "MARVEL" No. 8 Metal Band Saw

The Marvel No. 8 saw will handle your metal sawing jobs rapidly and accurately. It's a saw of great range, capacity and efficiency. Cuts in any position, with blade frame upright for cutting off square or, with blade frame tilted for cutting on an angle. The Marvel No. 8 saws bars, beams, channels, tubes, etc. Big capacity up to 18 inches.



Write for Catalog of Marvel Saws

Armstrong-Blum Mfg. Company
347 N. Francisco Ave., Chicago, Ill.

Victor Hack Saws

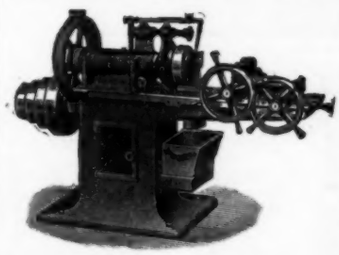
EXPERIENCE IS THE GREATEST TEACHER

"Get a box and try them"

Victor Saw Works
Middletown, N. Y.

AVOID HACK SAW TROUBLE. WRITE FOR BOOKLET.

Strength and Weight



help to give Acme Bolt and Nut Machines their undoubted superiority as immediate cost reducers on all work in their capacity.

They turn out work faster than others and perfect accuracy can be depended upon. Write us for description of our entire line. Catalog?

THE ACME MACHINERY COMPANY
CLEVELAND, OHIO, U. S. A.

The

HIGLEY

Cold Metal Saw

Catalog will be sent on application to

Vandyck Churchill Company
52 Vesey Street, New York

HACK "STERLING" SAWS

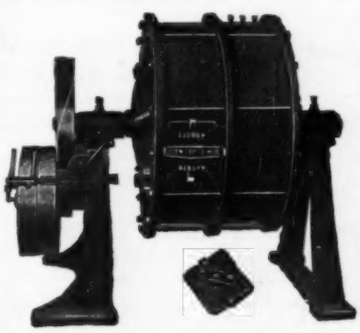
Diamond Saw & Stamping Works, Buffalo, N. Y.

Lea Simplex Cold Saws

Fast—Easy to Operate—Large Capacity
Minimum Waste of Stock

Designed, Manufactured and Sold by
The Earle Gear & Machine Co.
Philadelphia, Pa., U. S. A.

Finish Parts by the thousands the Abbott Way



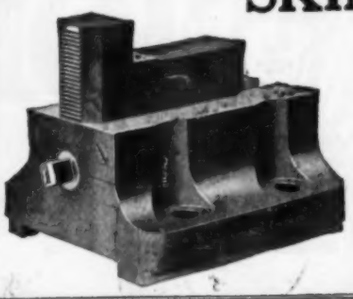
It is not necessary to finish your metal parts one at a time to obtain a high quality finish. The Abbott Burnishing Process will finish them by the thousands, giving a finish better than any other method at a lower cost. The parts are put in an Abbott specially designed burnishing barrel and with Abbott hardened steel balls and tumbled. These balls are as smooth as glass and exceptionally hard. The illustration shows an Abbott 30 in.x 8-in., two-compartment barrel.

If you are interested send us samples of your work to burnish free of charge. Also write for Catalog 104-T.

THE ABBOTT BALL COMPANY
P. O. Box 1233, Hartford, Conn.

TRADE MARK

SKINNER BORING MILL JAWS



Note the powerful, compact construction of these sturdy jaws. For heavy duty work on boring mills and large lathes these jaws, fitted to the parallel slots in the face plate or table by means of the double rib, insure a most positive grip. ***Furnished in iron or steel body—single or double rib, as desired.***

THE SKINNER CHUCK COMPANY
NEW BRITAIN, CONN U.S.A.

Established 1887

New York Office: 94 Reade Street
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San Francisco Office: Rialto Building
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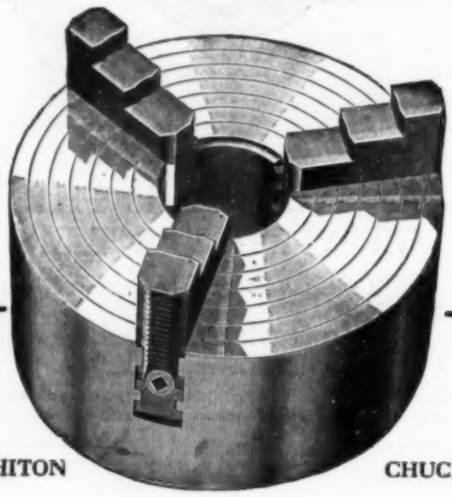


WHITON CHUCKS

Reversible Jaws
Can be used Universal or Independent

The wide range afforded by each member of the Whiton Chuck Family means a big saving in time and labor on tooling operations. The jaws have ample tooth surface; can be used independent or universal; are reversible, and provided with hardened steel thrust shoulders. Could you wish for better equipment?

Write for full details

D. E. Whiton Machine Company
New London, Conn.

European Address: Selson Engineering Co., Ltd., 85 Victoria St., London, E. C.

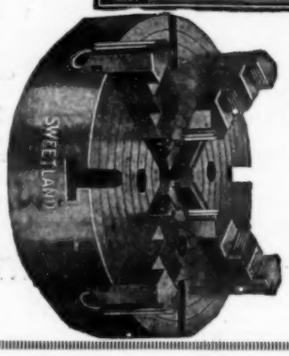
"Whiton" Chucks sold and kept in stock by principal dealers all over Europe.

No drawback rods to reduce spindle capacity

There are no drawback rods in the makeup of the Ney Positive Grip Collet Chuck to reduce the capacity of the spindle for bar work. As an economical machining unit it has no peer—its six collets do the work of eighteen ordinary ones. Irregular bar stock—round or hex—is gripped without adjustment. Write for our Illustrated Folder, describing its other good points.

The J. M. Ney Co., Hartford, Conn.

SWEETLAND CHUCKS



The body is ribbed to absolutely prevent buckling or spring under severe strain. Have you a *rcent* Catalog?

The Hoggson & Pettis Mfg. Co.
New Haven, Conn.

Westcott Chucks

Little Giant Auxiliary Screw Drill Chuck

The standard of the world for mechanical perfection. Grip tightest—wear longest. For lathes and drills.

A type for every use.

Write for Catalogue "A.M."

WESTCOTT CHUCK CO., Oneida, N. Y.

CUSHMAN CHUCKS

4 Jaw Independent Type
"The Incomparable"
also
Self-Centering (Geared Scroll Type) 2 Jaw Lathe Chucks
"The Hartford" Drill Chucks

WRITE US FOR BOOKLET "The Incomparable"

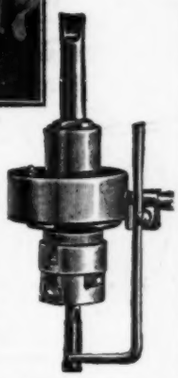
THE CUSHMAN CHUCK CO. HARTFORD, CONN., U.S.A.

Errington Auto Reverse Friction Tapper

Style C.

Tapping Blind Holes in Air-Cooled Automobile Cylinder

(AMERICAN MACHINIST, Mar. 14, 1907)



The breakage of a single tap on this job would cause an intolerable blemish in the appearance of the piece and result in heavy loss in time and money. The **Errington Sensitive Adjustment** and **Quick Reverse** insure perfect results. Regulate the power of the machine to just drive and remove all danger of breaking the tool or injuring the work. Fool proof, fits any drill press, and taps steel as safely as cast iron. Seven sizes, ⅜ in. to 2 in.

Errington Mechanical Laboratory

Broadway and John St., N. Y. City

Phone: Cortland 3149

New England Branch, 831 Old South Bldg., Boston, Mass.; Chicago Branch, 612 W. Adams St.; Catalog Francais, Edgr Bloxham; Paris, 12 Rue du Delta

We Make Nothing But Chucks

Union Chucks are always "up to the minute." Our entire efforts are devoted to the development of chucks and every dollar expended in a Union assures ample returns in service. Correct design and proper materials give Union Chucks the stamina to stand hard usage.

Union Manufacturing Co.

26 Cortlandt St., N. Y.
New Britain, Conn., U. S. A.
Makers of a Complete Line of Chucks

Our Catalog shows full line. Send for your copy.

(Geo.) Ford says:—

"Did you ask how we drill and tap so many different sized holes without stopping the spindle to change drills or taps?

"Easy!

"Those Wahlstrom Quick Change (Automatic) Chucks do the trick.

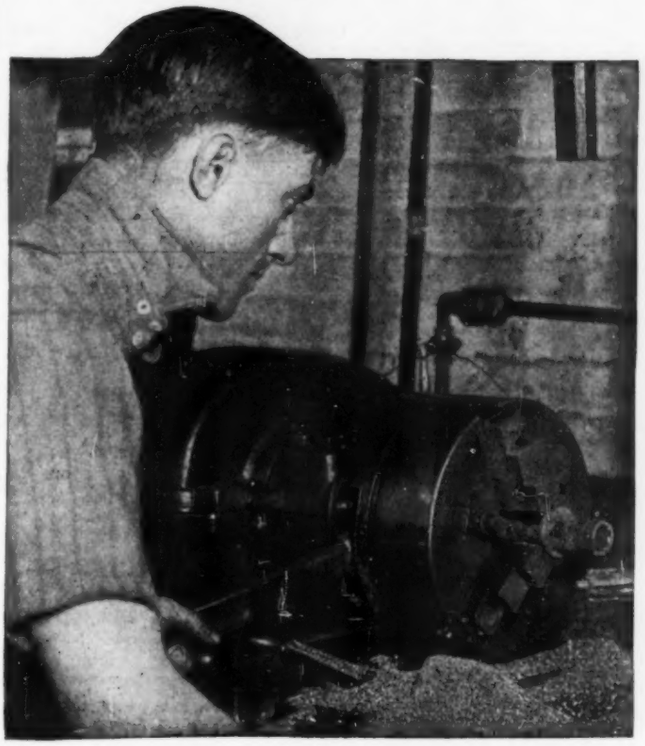
"We even tap with them. Yes sir:

"First drill the big hole, take drill out of chuck, put in the tap (Pinned in hexagon shank) tap hole—take out tap."

Tear this advertisement out, write name and address on margin, mail, and more details with free trial offer will follow with name of your nearest dealer.

WAHLSTROM TOOL CO.
5520 Second Ave., Brooklyn, N. Y.

BARKER
Wrenchless Chuck



A Complete Chucking Unit in Itself; Requires No Accessory Installations

THE BARKER WRENCHLESS CHUCK* affords the simplest, the surest and the fastest method of chucking. It is attached to the spindle of a lathe or screw machine in much the same manner as any other chuck. It can be removed just as readily as a face plate. The jaws are universal in action. They are closed instantly on the downward movement of the lever, and released on the upward movement. The holding pressure can be adjusted while the spindle is in motion.

Thomas Elevator Company

(*Chuck Division*)

27 South Hoyne Avenue, Chicago

**The Barker Wrenchless Chuck was developed and is manufactured in the Chuck Division of Thomas Elevator Company—a separate department maintained for this single purpose.*

Standardized in Modern Shops

FOR the quantity production of duplicate parts, **Randall & Stickney Model C Dial Gauges** are rapidly becoming standard checking equipment. They are readily attached to grinders, millers, lathes, etc., or may be used in connection with surface gauges and they have a ½-in. range.

The range of **Randall & Stickney Dial Measuring Instruments** is broad. Send for set of Bulletins.

RANDALL & STICKNEY, Waltham, Mass.
Makers of Gauges over 40 years

Cut out time-eating jacks, wedges, clamps!

What happens when blue prints show an angular job? Do your men spend valuable time figuring out the set up, and then build it up with clamps and wedges or jacks? You can cut out the figuring and the other items as well as if your machines are equipped with Universal angle plates.

Write for full details

Universal Angle Plate

Boston Scale & Machine Company
100 Ruggles Street, Boston, Mass.

COCHRANE-BLY CO.

10-in. Compound Circular Table
A UNIVERSAL PROTRACTOR

With this device you can work from any number of centers at one setting of the work, such as required on Dies, Jigs, Templates, Cams, Etc.

Write for Circulars and Prices.

Cochrane-Bly Co.
Rochester, N. Y. U. S. A.

AMES MICROMETER DIAL GAUGES

Convenience, accuracy and speed combined with durability and simplicity make an Ames Gauge an ideal testing instrument.

A complete list of sizes and types is contained in our catalog A.M.

B.C. AMES CO. WALTHAM MASS. U.S.A.

A Report On GARVIN Wrenchless Chucks

from a large brass goods plant advises a 50% reduction in cost by the use of these chucks. Is this not worth while investigating at your plant?

Two and Three Jaw Carried in Stock

For Further information { Ask Your Dealer or Write Us Direct

Full description in Chuck Catalog

The Garvin Machine Company
Spring and Varick Sts. **50 Years in New York City**

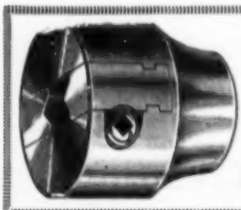
Greater efficiency from magnetic chucks

Can be obtained by the use of the O. S. Walker Demagnetizer which will remove the last traces of magnetism, from hardened steel or cast iron parts, and from tools, in a few seconds. Built to the same standard as our chucks, simple, efficient and fully protected against hard usage. Can be used with or without our Automatic Countershaft.

Write for Circular K-2

O. S. Walker Co., Inc., Worcester, Mass.

O. S. Walker Demagnetizer



REID DRILL CHUCKS

Body is of Steel, with Crucible Jaws and Special Steel Screws. Made to last. Parts interchangeable. Small drills held without bending or bruising the shank. Three sizes, 0-in. to ½-in., 0-in. to ¾-in., 0-in. to 1-in.

Write for Descriptive Circular and Prices.

R. H. BROWN & CO., New Haven, Conn.

CHUCK WITH AIR

The Lavoie Air Chucks are very simple in construction and are easy to operate. The grip is absolutely certain, as is the release. Made in seven types with six styles of jaws.

Write for particulars.

FRONTIER CHUCK & TOOL COMPANY
34 Letchworth St., Buffalo, N. Y.

ALMOND "STRAIGHT LINE" DRILL CHUCKS

When buying Portable Electric Drills be sure to look for the distinctive ALMOND CHUCK, which may be easily identified by the "STRAIGHT LINE" milling on the chuck body.

Write for complete information regarding the new ALMOND "STRAIGHT LINE" CHUCKS.

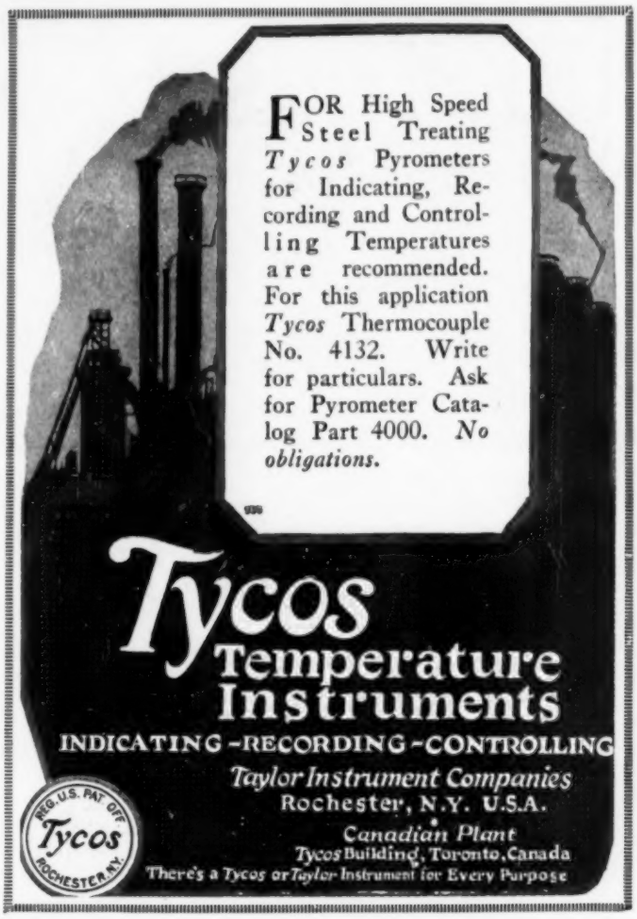
T. R. Almond Mfg. Co., Ashburnham, Mass., U. S. A.

WILLIAMS

"Better Threads at Lower Cost"

Pipe and Bolt Threading Machines
Belt or Motor Driven—Range ⅛ in. to 24 in.

WILLIAMS TOOL CORPORATION, ERIE, PA
Canadian Plant, Brantford, Ont.



FOR High Speed Steel Treating *Tycos* Pyrometers for Indicating, Recording and Controlling Temperatures are recommended. For this application *Tycos* Thermocouple No. 4132. Write for particulars. Ask for Pyrometer Catalog Part 4000. *No obligations.*

Tycos Temperature Instruments

INDICATING-RECORDING-CONTROLLING

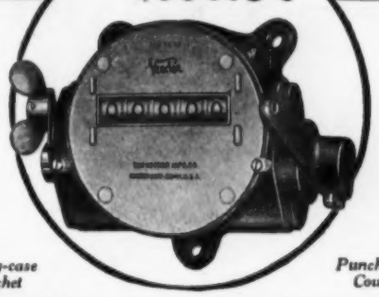
Taylor Instrument Companies
Rochester, N.Y. U.S.A.

Canadian Plant
Tycos Building, Toronto, Canada

There's a *Tycos* or *Taylor* Instrument for Every Purpose

REG. U.S. PAT. OFF. Tycos ROCHESTER, N.Y.

Veeder



Heavy-case Ratchet *Punch Press Counter*

WHY not expect all hands to work a bit harder, to make things easier on the *cost* end? *Know* what you ought to expect of each workman — at each of your different machines. Veeder Counters will measure the output — actual and obtainable: they will show how the men *measure up*. For real payroll economy, send now for the Veeder booklet.

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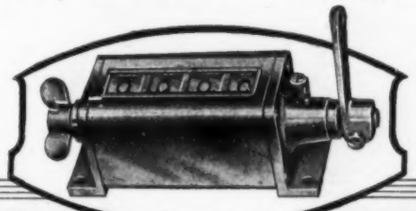

They're durable—

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Model D Dial Indicators

are designed particularly to retain their accuracy under the severe conditions met with in manufacturing plants.

Unskilled operators can instantly detect machining errors of .00025 in. or less with a Federal.

They're an economical investment.

Send for the complete list of Federal Instruments.

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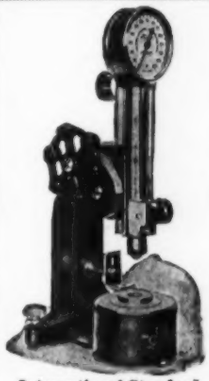

International Standard Scleroscope (Hardness Tester)

The Scleroscope

is now used in hundreds of plants for its accuracy in hardness testing. It is direct reading and can readily be operated by anyone. Ranges from softest metals to hardest steels without adjustment. It is invaluable in ordering materials to specifications. The free booklet will interest you.

The Shore Instrument & Mfg. Co.
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Agents for Great Britain and Colonies, Coats Machine Tool Co., Ltd., London S.W. Japan, Messrs. Yamatake Company, Tokyo. France. Aux Forges de Vulcain, Paris, etc.

Brown Pyrometers
Most used in the world
For Every Phase of Heat-Treating
Write for Folder 23-14
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Model B (Five wheels)
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MODEL B GEAR COUNTER

will give you your accurate production. Tested 20,000 per hour.

Send for circular

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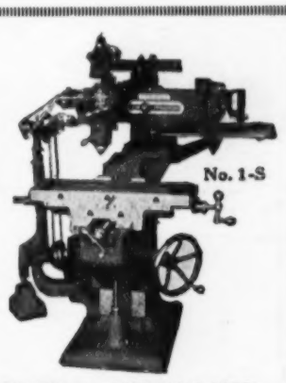
Our experience in the field of engraving machines has enabled us easily to meet the demand for a heavy engraving machine for cutting dies, steel stamps, large size letters gun work, lettering bottle, moulds and simiar jobs in steel, brass and cast iron.

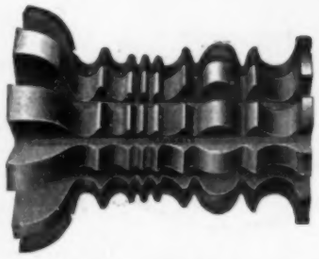
The same savings are possible with this machine as are being made very day by our smaller machine on light work.

Here is a chance to effect a considerable saving. Write us and let us give you facts and figures on your work.



GEO. GORTON MACHINE COMPANY
Racine, Wisconsin

FORMED CUTTERS



IF MADE RIGHT, help produce duplicate parts with great accuracy. If you would be sure that your special cutters are all they should be in *original accuracy and lasting power,* you should specify "MORSE."

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TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS. U.S.A.

THE GENUINE MORSE DRILLS ENCIRCLE THE GLOBE

Heat-treating Can Be Done

JOHNSON with a **Furnace** without a **Blower**

The No. 108 Bench Type for heat-treating and soldering. Firebox 6¼ x 5 x 6½ inches.

Write for descriptive Catalog No. 108

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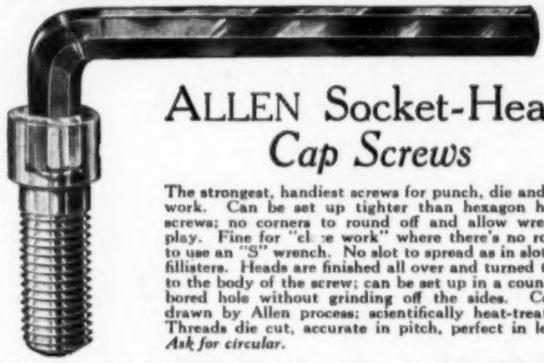
COLLAPSIBLE TAPS
Generally Recognized as the Best

Stationary or Rotary types for straight or tapered threads. Any size from 1 in. up. Chasers are fully supported guaranteeing straight threads and long life.

Let us tell you why you should use a VICTOR. Ask for Catalog No. 10.

Victor Tool Co.
Waynesboro, Pa.



ALLEN Socket-Head *Cap Screws*

The strongest, handiest screws for punch, die and jig work. Can be set up tighter than hexagon head screws; no corners to round off and allow wrench play. Fine for "close work" where there's no room to use an "S" wrench. No slot to spread as in slotted fillisters. Heads are finished all over and turned true to the body of the screw; can be set up in a counterbored hole without grinding off the sides. Cold-drawn by Allen process; scientifically heat-treated. Threads die cut, accurate in pitch, perfect in lead. *Ask for circular.*

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18511 Euclid Avenue Cleveland, Ohio

CUTTERS OF ALL KINDS
MULTIPLE SPINDLE HOBBERS
HORIZONTAL BORING, DRILLING AND MILLING MACHINES

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Twist Drills, Reamers and Special Tools

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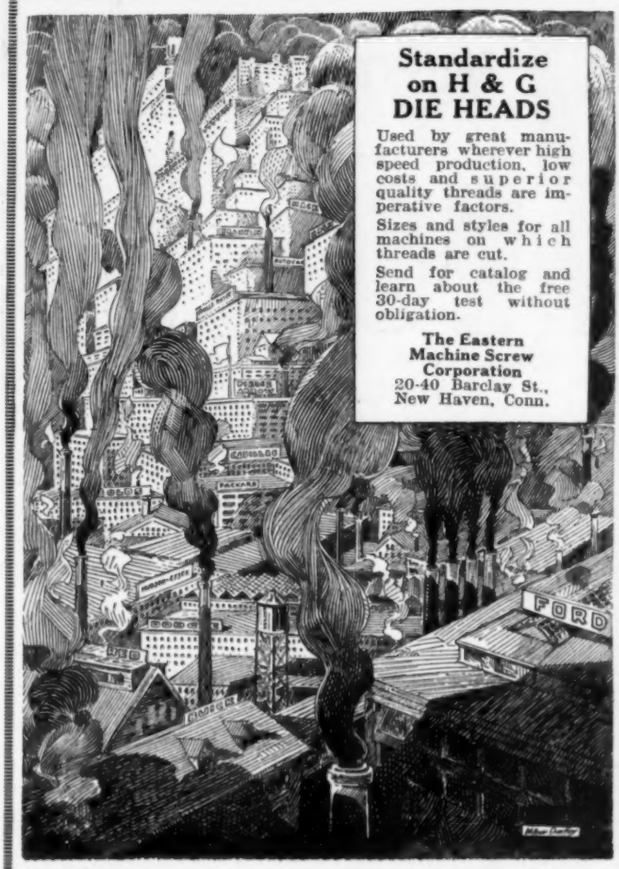

Standardize on H & G DIE HEADS

Used by great manufacturers wherever high speed production, low costs and superior quality threads are imperative factors.

Sizes and styles for all machines on which threads are cut.

Send for catalog and learn about the free 30-day test without obligation.

The Eastern Machine Screw Corporation
20-40 Barclay St.,
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Consider their economy—

LOVEJOY Inserted Cutter Tools

You can take big feeds without any danger of slipping for the "Lovejoy" holds the cutter as firmly as a solid forged tool. And the Lovejoy gives three or four times the service.

Our catalog will show you other economies.

LOVEJOY TOOL COMPANY, INC.
SPRINGFIELD, VERMONT, U.S.A.

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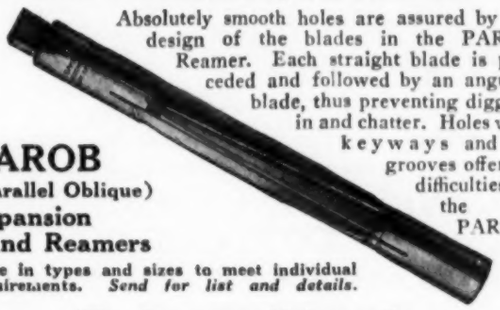
The Chadwick Co., 540 W. Washington Blvd., Chicago, Ill. For British Isles: Selby Engineering Co., 92 Fenchurch St., E. C. 3. For France, Belgium and Spain: F. Auberty & Co., 182 Rue Lafayette, Paris, France.

Mechanically Correct



Absolutely smooth holes are assured by the design of the blades in the PAROB Reamer. Each straight blade is preceded and followed by an angular blade, thus preventing digging in and chatter. Holes with keyways and oil grooves offer no difficulties to the PAROB.

PAROB
(Parallel Oblique)
Expansion Hand Reamers
come in types and sizes to meet individual requirements. *Send for list and details.*

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"Extra Service" Tools
Milling Cutters, Spur and Worm Gear Hobs, Reamers, Interchangeable Counterbores, Special Tools.

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Precise—Uniform—Durable
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Milling Cutters for Every Job
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HIGHEST GRADE FILE MADE. THE FILE YOU WILL EVENTUALLY USE

FILES OF QUALITY

DELTA FILE WORKS, Philadelphia

Bennett Oil Hole Covers

are self-closing. Dust and grit are not permitted to score the bearings. It is a simple matter to adjust one of the covers. Drill the oil hole of proper size and insert the cover by a little pressure.

It is economical, convenient, and does not interfere with proper cleaning.

Our catalog M gives our full line.
Write for one today.

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380 Chandler Street
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No use using good oil, if—

Style D. Opened.

You put in dirt as well, and that's what happens when oil holes are left uncovered. **Tucker Oil Hole Covers**, simple, self-closing efficient and good-looking, find a logical place on every oil hole. Start fitting them right now.

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Style G. Opened.

W. A. & C. F. TUCKER, Hartford, Conn., U. S. A.
Foreign Agents: Fenwick & Co., Paris, France
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This Way Is Easier

Just immerse the wash basket of parts to be cleaned of oil, grease and chips into the **Gray & Prior Soda and Potash Kettle.**

This is the easiest way to thoroughly and economically cleanse newly made machine parts, such as screws, nuts, bolts, gears, studs, etc.

Two cents' worth of common sal soda to the gallon of boiling water takes the place of expensive gasoline cleansing and eliminates all fire risk.

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GITS OIL CUPS

Give perfect satisfaction where others fail. State style and size in which you are interested, and we will send free samples and catalog.

Gits Bros. Mfg. Co.
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A free sample to prove it!

Minolard will speed up production and lengthen the life of your tools. Does not foam or gum, separates readily from chips, and is free from injurious acids. Made and guaranteed by makers of ECONOMY Grinding Lubricant.

Test it on your own work!

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Gledhill Center Drills should be in every tool kit
Gledhill combination Center Drills are made from a special alloy steel. This assures great strength and superior cutting qualities. Expert workmanship enhances accuracy and high speeds are possible without temper drawing. You need this Center Drill in your kit. Get the Circular for sizes and prices.

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DAVIS KEYSEATERS AND CUTTERS

Cutters and broaches for all kinds of Keyseaters.

DAVIS KEYSEATER COMPANY
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for Tools of Every Description

Branches and Stocks in All Principal Cities

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Only reliable products can be continuously advertised

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Positions Wanted, 1 cents a word, minimum 75 cents an insertion, payable in advance.
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WANTED by a concern building light, medium and heavy weight automatic machinery a mechanical engineer who has had a long and varied experience with intricate wire working and sheet metal machinery. Would be interested in an engineer who has a patented machine to build for which there is a large demand. Old and reputable concern. Position permanent. P-39, Am. Mach., 10th Ave. at 36th St., New York.

Michigan

WANTED a high-grade man on time study, cost and estimating, tool die and special machinery design. Must be married, state age, length and kind of experience, salary; give references; to a man willing to forego high life of city and settle in small town, have a real opportunity to offer. P-996, American Machinist, Leader-News Bldg., Cleveland, Ohio.

Ohio

WANTED man to fill position of chief inspector, must be an experienced tool and die maker, preferably one who has been a foreman with experience in the manufacture of equipment for high speed production, also experienced in the handling of men. Approximately 50 miles south of Cleveland, Ohio, in nationally known manufacturing concern, a very good and steady position for right person. In reply state age, experience and give references as to recommendation, also salary on past work. P-26, Am. Mach., Leader-News Bldg., Cleveland, Ohio.

Pennsylvania

WANTED: Capable designer of heavy machine tools, boring mills, horizontal boring and drilling machines, etc. Designer having practical education combined with theoretical, preferred. Give age, experience and references. None but the most capable will be considered. Communicate with P-30, Am. Mach., Real Estate Trust Bldg., Phila., Pa.

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OVERTURES negotiated through the confidential correspondence service of the undersigned, for salaried positions $2,500 to $25,000—executive, mechanical, administrative, engineering, technical, financial, manufacturing, sales, advertising, professional, etc., etc.; all lines. Established fourteen years; not an employment agency. Retaining fee refunded as provided in our "Refund Contract" if service is not satisfactorily rendered as per contract, and such refund be requested within three months from date remitted. Send name and address only for particulars. R. W. Bixby, Inc., 703 Lockwood Building, Buffalo, New York.

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EXPERIENCED engineer desires position experimental, model to production, thoroughly familiar machine shop, toolroom, designer. Prefer East. PW-32, Am. Mach., Old Colony Bldg., Chicago, Ill.

POSITIONS WANTED

Connecticut

WORKS manager or factory superintendent; age 43; experienced and seasoned on production and mechanical end, also tool designing. PW-22, American Machinist, 10th Ave. at 36th St., New York.

Indiana

MECHANICAL engineer with 14 years' engineering and manufacturing experience, invites correspondence from manufacturers seeking a production or shop superintendent. PW-38, Am. Mach., Old Colony Bldg., Chicago, Ill.

WANTED position as factory manager, production manager or production engineer by technical graduate, 35 years old, with 11 years' executive experience in metal working plants. PW-29, Am. Mach., Old Colony Bldg., Chicago, Ill.

Ohio

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SUPERINTENDENT or factory manager desires position to assume charge of plant, good organizer, practical and technical man, can furnish A-1 reference. PW-31, Am. Mach., Leader-News Bldg., Cleveland, Ohio.

TONE UP PRODUCTION on a saving sharing or salary basis, or both. My averages for the last twenty-two years are: output increased 121%, production labor cost reduced 74.5%, shop overhead reductions 31%. Can produce similar results for you. Address Post Office Box 2, Delphos, Ohio.

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Sales Representative

Wanted, to handle our exclusive line of automotive tools and equipment. The Specialties Co., 410 E. Virginia Ave., Denver, Colo.

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Progressive Up-to-date Man

Keenly alive to the possibilities of business, calling upon ironmongers, motor engineers and tool makers, wishes to get in touch with an actual manufacturer of goods, confined to these trades, to sell on commission basis in the British Isles. Principal does his own travelling, also employs commercial traveller, and has a suitable place of business, with adequately equipped machine shop, established over fifty years. Would consider carrying representative stock. Only sound selling propositions considered. Write Box 806, c/o Streets, 8 Serle Street, London, W. C. 2, England.

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SALES engineer, graduate mechanical engineer with six years' manufacturing experience and four years' selling experience, desires position as sales engineer, thoroughly competent and reliable. SA-13, Am. Mach., 10th Ave. at 36th St., N. Y.

PATENT ATTORNEYS

PATENTS. Booklet free. Highest references. Best results. Send drawing or model for examination and opinion. Watson E. Coleman, Patent Lawyer, 644 G Street, Washington, D. C.

PATENT ATTORNEYS

PATENTS, C. L. Parker, patent attorney. McGill Bldg., Washington, D. C. Inventor's handbook sent upon request.

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We Are Seeking Manufacturing Connections

For a very fine line of medium to heavy gray iron foundry and machine work, also large quantity of cut gears, etc. This is one of the oldest and most lucrative lines of machinery on the market and being of a standard type and can be handled in quantity production. The demand is large and constant and used only by the largest concerns in the country. It is also covered by basic patents giving us absolute control of the manufacture and sale of same. BO-33, Am. Mach., 10th Ave. at 36th St., New York.

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"We Are Open to Buy 3-in. or 4-in.

FORGING MACHINE

with Steel Bed, guaranteed first class running condition. State particulars and history of Machine."

VERITY PLOW CO.
Brantford, Ont., Canada.

WANTED
Hobbing Machine
1—18 H Gould & Eberhardt, for cutting Spiral and Spur Gears. State condition, price and shipping point.
W-36, American Machinist
10th Ave. at 36th St., New York City

WANTED
Brown & Sharpe Milling Machine
No. 1 or No. 2, universal, with dividing head, also vertical head preferred. Must be in perfect condition.
W-37, American Machinist
10th Ave. at 36th St., New York City.

WANTED
Used Mitts and Merrill Punch Press with Shears. Also Plummer and Boynton Post Drill. State condition and price.
W-40, American Machinist
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Are You Contemplating Discontinuing Business?

WIRE, WRITE or PHONE US. We have a staff of engineers who understand your particular line and will make you a cash offer for your entire plant or will advise just how much money we can advance your company to start liquidating for your account.

REMEMBER you are under no obligation to us for any information we may give you along these lines.

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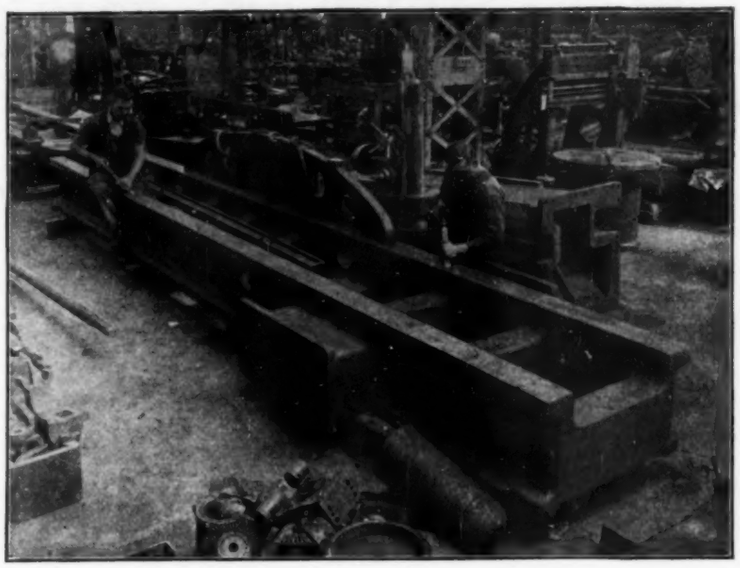
Watch the advertisements here. Any issue may hold just the opportunity you have been seeking, or one you would like to take advantage of.

On the other hand, if you have an opportunity to offer others in this field—equipment, employment, business, selling, etc.—you will find advertising it in the *Searchlight Section* the quick and efficient way to get the attention of interested persons.

For Every Business Want

Think* "SEARCHLIGHT" *First

G-22



Hand scraping the ways of a planer—a part of the ReManufacturing Process.

Accuracy

No manufacturer of machine tools anywhere uses greater care to insure accuracy and smoothness of operation, than is exercised in our process of Re-manufacture. We possess and use the most complete set of B. & S. straight edges in the middle West. The illustration gives an idea of the thoroughness of our method.

ReMANUFACTURED MACHINE TOOLS
-(ORIGINATED BY US)-
Reg. U. S. Pat. Off.

Lathes

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13—Porter-Cable.
10—3½ and 8-in. Fitchburg.
1—10-12-in.x5-ft. Pratt & Whitney.
7—14-in.x6-ft. Rockford.
2—16-in.x8-ft. Carroll Jamieson.
6—17-in.x6-ft. LeBlond Pi. Turning.
4—18-in.x8-ft. Walcott.
1—18-20x 8-ft. Amer., geared head.
12—20-in.x 8-ft. LeBlond.
50—20-in.x 8-ft. American.
1—20-in.x16-ft. American.
1—20-22-in.x16-ft. Amer., gd. hd.
5—22-in.x12-ft. Mueller.
1—24-in.x10-ft. American.
10—24-in.x10-ft. Cisco.
1—24-in.x16-ft. Lodge & Shipley.
7—25-in.x10-ft. LeBlond.
16—25-in.x12-ft. LeBlond.
1—24-in.x15-ft. Chard.
4—26-in.x10-ft. Walcott.
15—26-in.x10-ft. Whitcomb-Blaisdell.
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1—30-32-in.x20-ft. American.
1—30-34-in.x20-ft. American, gd. hd.
1—32-in.x12-ft. Pittsburgh.
2—36-in.x12-ft. Wickes.
3—36-in.x14-ft. Johnson, gd. hd.
1—36-in.x20-ft. Putnam.
1—36-in.x20-ft. Pittsburgh, gd. hd.
6—36-in.x30-ft. Pittsburgh, gd. hd.
4—36-in.x37-ft. N.-B.-P., gd. hd.
2—36-in.x42-ft. LeBlond, gd. hd.
3—40-in.x12-ft. Fifield.
1—36-in.x42-ft. Gisholt Gun Boring.
2—45-in.x24-ft. Pond.
1—33-51-in.x20-ft. LeBlond.
1—60-in.x18-ft. Johnson.
1—56-64-in.x18-ft. Johnston.

Planers

1—24x24-in.x 6-ft. American.
1—24x24-in.x 6-ft. Hamilton.
1—24x24-in.x 6-ft. Liberty, 2 heads.
1—24x24-in.x12-ft. Whitcomb.
1—30x30-in.x 6-ft. Gray spiral gd.
1—30x30-in.x6-ft. Cincinnati, 2 hds.
1—30x30-in.x10-ft. Cincinnati.
1—30x30-in.x10-ft. W.&P.
1—30x30-in.x14-ft. N.B.P., 2 hds.
1—36x30-in.x10-ft. Cincinnati, 3 hds.
1—36x30-in.x20-ft. Whitcomb-Blaisdell.
1—36x36-in.x10-ft. Bickett.
3—42x12-in.x16-ft. Rockford.
1—60x48-in.x10-ft. Gray.
1—72x56-in.x36-ft. Cincinnati.

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61—No. 3½ Fox.
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1—No. 1½ Rockford.
1—No. 1½ Cincinnati Univ.
2—No. 1½-B Special Milwaukee.
3—No. 2 Rockford, S.P.D.
10—No. 2-B Brown & Sharpe, S.P.D.
1—No. 2-B Kearney & Trecker.
1—No. 3-B Kearney & Trecker.
1—No. 2½ Rockford.
2—No. 3 Kempsmith.
1—No. 3 Brown & Sharpe.
1—No. 3 Brown & Sharpe, univ.
1—No. 4 Brown & Sharpe.
2—No. 4-B Brown & Sharpe.
2—No. 4 LeBlond.
3—No. 33 Kempsmith.
2—Type A, 28-in. Briggs.
2—4-in. Pratt & Whitney Spline.

Horizontal Boring Machines

1—No. 31 Lucas.
1—Garvin two-way.
3—No. 1 Barnes boriz., 2 heads.
2—Foote-Burt, 3-in. bar.
1—4-in. Newark.
1—No. 1, 3¾-in. Bar Barrett.
1—Rochester Floor Borer.

Turret and Screw Machines

1—1½ in. Cleveland, Automatic.
1—2-in. Cleveland, Automatic.
1—No. 56 Nat. Acme, Automatic.
1—No. 2 1-in. Bardons & Oliver.
1—No. 2 1-in. Warner & Swasey.
1—No. 2 ⅝-in. Pratt & Whitney.
2—No. 2 1/16-in. Foster.
4—No. 2 1¼-in. W.&S. Fox.
5—No. 3 1¼-in. Bardons & Oliver.
9—No. 3 1 5/16-in. Foster.
11—No. 4 1½-in. Wood.
1—2¼x26-in. Greenlee.
2—2½x26-in. P.&W., gd. hd.
2—3x36-in. Jones & Lamson.
1—No. 10 3-in. Bardons & Oliver.
2—No. 5-A Potter & Johnston.
6—6-A Model 2, Potter & Johnston.
2—18-in. Libby.
1—21-in. Gisholt.
8—24-in. Gisholt Motor Drive.
5—24-in. Gisholt.
26—24-in. Davis.
32—24-in. Steinle.
1—34-in. Gisholt

Grinders

1—No. 16 Besley Disc.
1—No. 75 Heald, internal.
1—No. 2 Fraser, univ.
3— 6x18-in. Landis.
6— 6x32-in. Norton.
1—10x36-in. Landis.
12—10x36-in. Norton.
3—10x72-in. Norton.
5—12x36-in. Landis.
1—12x120-in. Landis.
1—14x 36-in. Norton.
1—14x 48-in. Queen City.
13—14x 50-in. Norton.
5—14x 72-in. Norton.
1—16x 72-in. Norton.
1—84-in. Diamond Face.

Drill Presses

2—28-in. Superior T.A.
1—36-in. Snyder.
1—No. 121 Baker.
1—No. 315 Baker.
1—No. 24 Foote-Burt.
1—4-spindle Reed-Prentice.
5—2-3-4-spindle Henry & Wright.
10—6-spindle Allen.
4—No. M-4 Natco.
2—M-37 Natco Multiples.
1—No. 41 Natco.
1—Baush Multiple, 16 spindles.
1—D-31 Fox Multiple, 20 spindles.
2—No. 30 Natco.

Slab Millers

1—3-spindle Beaman & Smith.
1—24x24-in.x10-ft. Ingersoll, 1 vert. hd.
1—24x24-in.x12-ft. Ingersoll, 2 hor. hds.
1—24x24-in.x12-ft. Ingersoll, 2 vert. hds.
1—24x24-in.x12-ft. Ingersoll slab.
1—32x32-in.x12-ft. Ing. hor. duplex.
1—Beaman & Smith, open back.
1—30-in.x8-ft. Ingersoll, open side.
1—48-in.x10-ft. Newton.

Gear Cutters and Hobbers

8—No. 1 Farwell.
1—No. 2½ Bilton Gear Cutter.
1—No. 2 Barber Colman.
1—No. 3 Barber-Colman.
3—No. 1 Schuchardt & Schutte.
1—18H Gould & Eberhardt.
2—24-in. Gould & Eberhardt.
1—30-in. Flather.
7—No. 6 Fellows.
3—No. 3, 26-in. Brown & Sharpe.
1—No. 615 Fellows.

Vertical Boring Mills

6—24-in. Bullard, Vert. Turret Lathe.
8—24-in. Bullard, New Era.
1—30-in. Gisholt.
1—48-in. Colburn.
1—54-in. Bullard.
1—54-in. Colburn.

Vertical Millers

1—No. 2 Cincinnati, vert.
3—No. 4-B Becker, vert.
6—No. 3 Brown & Sharpe, vert.
1—No. 3 Cincinnati, vert.
1—No. 4 Cincinnati vert.
3—Model S. D. Becker, vert.
1—No. AB Becker, vert.
7—No. 5-C Becker, vert., New.
4—No. 6 Becker, vert.

Presses

1—No. 57 Toledo Nosing.
2—No. D. G. C. 56 Ferracute, gd.
3—No. 58 Toledo Nosing.
1—No. 87 Bliss gd., twin drive.
1—No. 69 Stoll, geared.

Radial Drills

3—4-ft. Carlton, Sens.
2—3-ft. American, Sens.
1—3-ft. Prentice.
1—4 ft. Cincinnati Bickford.

Miscellaneous

2—No. 2 & 3 J. N. LaPointe Double Broach.
2—No. 3 La Pointe Broach.
1—No. 3 J. N. La Pointe Broach.
3—No. 4 La Pointe Broach.
1—125-lb. United Hammer.

Shapers

1—15 in. Potter Johnson.
9—16, 20, 24, 28, 32-in. Ohio.

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2—NILES-BEMENT-POND 52 in., ver.
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1—ROCKFORD No. 2, horiz.
1—BEMENT-NILES 2½-in. bar, horiz.
1—LANDIS No. 35, horiz. floor type.

DRILLS—Upright and Radial
35—ALLEN 5 and 6-spindle, H.S.
3—SNYDER 28 in., vert.
1—MINSTER D-3, heavy duty.
4—3½-ft. MUELLER Radials, S.P.D.
1—FOOTE-BURT No. 25.
1—FOOTE-BURT 4½, 4-spindle rail.
4—HENRY & WRIGHT, 2, 3, 4 and 5 spindle, Class K.
2—HENRY & WRIGHT 4-spindle, B.B.
2—NEW TURNER No. 3, vert. turret.
1—N. B. P. 96-in. Ridgway, motor drive plain radial.
1—WESTERN 6-in., plain radial.
1—BAUSH, 6 ft.

DRILLS—Multiple Spindle, Rect. Head
1—NATCO No. 14, Q.C.G.
1—NATCO No. 30, 12 spindle.
1—BARNES 4 spindle, 20 in. long.
1—BAKER No. 416.
2—NEW BAUSH No. 3, 21 spindle.
1—NEW BAUSH No. 4, 56 spindle.
1—FOX, 6 spindle.

AUTOMATIC SCREW MACHINES
1—GRIDLEY 9/16 in., 4 spindle.
7—GRIDLEY 4-spindle, cap. 1¾/in.
6—CLEVELAND, Model A, ⅞-1¼ in.
2—CLEVELAND, 1¼ in.
2—NATIONAL ACME, No. 515, motor.
1—CLEVELAND 7⅝ in. Auto.
6—B.&S. No. 0, No. 00G, and No. 2.

MILLERS
Plain, Mfg., Universal and Vertical
2—MILWAUKEE No. 1½ plain.
1—CINCINNATI No. 2, plain.
1—CINCINNATI No. 3, plain.
1—BROWN & SHARPE No. 2, plain.
1—MILWAUKEE No. 3-B, plain.
1—MILWAUKEE No. 3-B, universal.
1—LEBLOND No. 3 Universal.
2—BRIGGS Type B.
1—BROWN & SHARPE No. 4 plain.
1—RAHN-LARMON, 18x14.
2—MILWAUKEE, 2-B, plain.
2—TAYLOR & FENN, vertical.
1—BECKER No. 2, vert.
1—BECKER No. 3, vert.
1—BECKER No. 4-B, vert.
5—BECKER No. 5-C, vert.
1—BECKER "C," vert.
5—BECKER No. 6, vert., 62-in. table.
2—NEW GARVIN No. 2 Duplex.
1—NEWTON Duplex.

GEAR CUTTERS
2—BILTON No. 1.
2—BARBER-COLMAN No. 2.
1—HERCULES 8 in.
2—BROWN & SHARPE, 3x26.
2—B.&S. No. 4, 36 in., heavy.
1—GOULD & EBERHARDT 18x12 S.P.D.
1—GOULD & EBERHARDT, 60-in. spur.
1—B.&S. 26-in. spur and spiral.
1—FELLOWS No. 61.
3—FELLOWS No. 6 and No. 612.
2—GLEASON 6-in. bevel.
1—GLEASON 11-in. double tool gen.
5—GLEASON 18-in. double tool gen.

PLANERS
7—PUTNAM, 26x26x8 ft., 2 hds.
1—WOODWARD & POWELL, 36x36x12 ft., 4 hds.
1—PUTNAM, 48x48x12 ft., 2 hds., motor drive.
1—PUTNAM, 48x48x30 ft., 4 hds.
1—CLEVELAND Openside, 30x30x8.
1—CLEVELAND Openside, 30x30x10.
1—CLEVELAND Openside, 36x36x10.

GRINDERS
1—SPRINGFIELD-BRANDES, 12x12x48, vert
1—P.&W. 36 in., vert., surface.
2—BROWN & SHARPE No. 2.
1—BROWN & SHARPE No. 13, universal.
1—BROWN & SHARPE, No. 14, plain.
16—CINCINNATI No. 2, 12x36.
1—NORTON, 6x32.
2—NORTON, 10x36.
2—LANDIS, 10x20.
1—FITCHBURG, 12x54.
1—NORTON, 16x36.
10—BRYANT No. 20, chucking.
2—HEALD No. 60 cylinder.
2—HEALD No. 65.
6—HEALD No. 70.
3—HEALD Rotary Surface Nos. 210, 255, 260.
6—SELLERS No. 1 Univ. tool & cutter.
1—VAN NORMAN No. 34.

TURRET & SCREW MACHINES
1—FOSTER No. 1-B turret.
1—WARNER & SWASEY No. 2-A.
2—WARNER & SWASEY No. 3-A.
3—FOSTER No. 2-B turret.
1—NEW FOSTER No. 10 turret.
4—GREENLEE 2¼x26-in. turret.
1—J.&L., 2x24.
1—J.&L., 2-spindle turret.
1—J.&L., 3x36-in., flat.
25—NEW wire feed, plain hd. screw.
2—NEW MILHOLLAND No. 4.
5—FOSTER No. 4 screw.
1—ACME, 1½-in. turret.
1—W.&S. No. 6, B.G., P.F.
6—GARVIN No. 1 S.P., wire feed.
2—P.&W. ⅝-in. screw.

LATHES
NEW STAR LATHES, ALL SIZES WITH ALL ATT.
12—NEW SOUTH BEND, 16x8 and 18x8 gap.
1—PRATT & WHITNEY, 12x5.
2—SEBASTIAN, 13x5 ft.
10—NEW SOUTH BEND, 15x5 ft.
12—NEW SOUTH BEND, 16x8, 18x8 gap, 21x14.
3—NEW 16x8, DAVIS, Q.C.G.
2—LEBLOND, 21x12, automobile lathes.
1—LEBLOND, 26x12 Univ. crankshaft.
1—WALCOTT, 26x14, 6-in., Q.C.G.
1—WALCOTT, 26x16 ft. Q.C.G.
1—GREAVES-KLUSMAN, 20x10.
1—JOHNSON, 30x12 lathe, motor drive.
1—BRIDGEFORD, 36x36, geared head.
1—BRIDGEFORD, 42x32, geared head.
2—LOSWING, 5½x84, 2 carriages.
300 Additional Lathes, All Sizes and Makes

SHAPERS AND SLOTTERS
1—G.&E., 16 in.
1—AMERICAN 28 in.
1—NEWTON 10-in. slotter.
1—PRATT & WHITNEY 10-in. slotter.

PRESSES
2—TOLEDO No. 53, flywheel.
2—TOLEDO No. 55, seared.
2—TOLEDO No. 55½, seared.
3—TOLEDO No. 34-G, seared.
1—BLISS No. 1½ double action cam.
4—BLISS No. 64 double action.

MISCELLANEOUS
1—ACME bolt cutter, 3-in. cap. motor.
1—ACME bolt cutter, 2 spindle, 1 in.
1—ACME 1-in. cap. dbl. hd. Bolt Cutter.
1—LANDIS 1-in. Bolt Cutter, dbl. hd.
1—LANDIS 1¼-in. cap., 3-spdle. Bolt Cutter.
1—LANDIS 1½-in. Bolt Cutter, dbl. hd.
1—LANDIS 1½-in., 3-spdle. Motor Dr. Bolt Cutter.
1—LANDIS 2-in. Bolt Cutter, dbl. hd.
1—New No. 6 QUICKWORK Rotary Shear, 1-in. cap.
1—QUICKWORK No. 4-B rotary shear.
1—LONG & ALLSTATTER No. 3 punch.
1—HILLES & JONES No. 2 plate panel.
1—WICKES single end, motor driver.
2—P.&W., 4½x12-in. thread millers.
2—P.&W. 6x14-in. thread millers.
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1—NEW LITTLE GIANT 25-lb. HAMMER.
1—ERIE 1100-lb. hammer.
1—ACME Upsetter, ⅝-in. cap.
3—HIGLEY No. 14 cold saws.
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1—14-in.x 6-ft. Walcott Lathe.
1—18-in.x14-ft. American Lathe, without screw cutting attachment.
1—16-in.x 8-ft. Automatic Machine Co. thread chasing lathe.
1—36-in.x8-ft. American Turret Chucking Lathe.
1—2x17-in. Warner & Swasey Flat Turret Lathe.
2—2x24-in. Jones & Lamson Flat Turret Lathes.
1—16-in. American Bk. Gd. Crank Shaper.
1—20-in. American Bk. Gd. Crank Shaper.
1—22x22-in.x 5-ft. Whitcomb Planer.
1—30x30-in.x10-ft. American Planer, 2 hds.
1—48x36-in.x18-ft. American Planer, 4 hds.
1—3-ft. American Sensitive Radial Drill.
1—2-ft. American Radial Drill.
1—3-ft. Dreses-Mueller Radial Drill.
1—3-ft. Mueller Radial Drill.
1—6-ft. Bickford Plain Radial Drill.
1—6-ft. Fosdick Plain Radial Drill.
1—No. 217 Baker Heavy Duty Drill.
1—No. 2½ LeBlond Plain Horizontal Milling Machine.
1—No. 3 Cincinnati Plain Horizontal Milling Machine.
1—No. 3 Cincinnati Vert. Milling Machine.
1—No. 1 Beaman & Smith Floor Type Boring Machine.
1—No. 6 Bryant Semi-automatic Hole Grinder.
1—No. 120 Gardner Disc Grinder.
1—No. 11 Brown & Sharpe Plain Grinder.
1—6-in. Houghton & Richards Metal Cutting Band Saw.
1—No. 54 National Auto. Screw Machine.

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Cincinnati, U. S. A.
Lathes—Planers—Shapers—Radial Drills

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BULLARD MILLS
1—24-in. Bullard Vertical Turret Lathe, New Era type, belted motor drive. Like new.
1—24-in. Bullard Vertical Turret Lathe, Rapid Production type, standard belt drive. Excellent condition.

RADIAL DRILLS
1—6-ft. Baush Radial Drill (brand new).
2—3-ft. American Sensitive Radial Drills.
2—3-ft. Carlton Sensitive Radial Drills.

LATHES
1—36-in. x 14-ft. Putnam Lathe, D.B G. Triple geared, face plate drive. Nearly new.
1—26-in. x 12-ft. Putnam Lathe, D.B.G. Quick change gear. Nearly new.
1—20-in. x 8-ft. Hendey Lathe, latest type, tie bar head, 3-step cone, D.B.G. Condition 99% new.
1—16-in. x 6-ft. Pratt & Whitney Tool Room Lathe, taper attach., relieving attach. Condition nearly new.

PRESSES
1—No. 6 Rockford Straight Side Geared Press, distance col. 18 in., weight 6,500 lb.
1—No. 5 Bliss (Stiles type) Geared Punch Press, weight 9,000 lb.

PLANERS
1—30-in. x 30-in. x 8 ft. Powell Planer, two heads on cross rail.
1—24-in. x 24-in. x 6-ft. Whitcomb Planer.
1—18-in. x 18-in. x 4-ft. Whitcomb Planer.

MILLERS
No. 2 Van Norman Duplex Miller, complete.
No. 3 Hendey Univ. Miller, complete.
No. 2 Rockford Plain Miller, H. D. with dividing head.
No. 2 Cleveland Plain Miller, S.P.D.
No. 3 Cincinnati Plain Miller.
No. 1½ Cincinnati Universal Miller, complete.

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3-ft. Mueller, cone pulley drive.
3½-ft. Cincinnati-Bickford, tapping attmt.
52-in. American Sensitive, New.
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1-spindle Allen ball bearing.
4-spindle Avey ball bearing.
20 in, 24 in., 26 in., 28 in., 32 in. uprights, all makes.
3, 4, 5, 6, ft. radials, all makes.
4 ft. Hammond high speed wall radial.
D-2 Colburn manufacturing drill.
No. 513 Baker, heavy manufacturing type.
No. 12 Natco multiple spindle drill.
No. 13 Natco multiple spindle drill.
No. 14 Natco multiple spindle drill.
8-spindle Fox multiple spindle drill.
2-, 3- and 4-spindle Barnes 20-in. humpback.

BORING MILLS

No. 0 Giddings & Lewis, table type, horizontal 3-in. bar.
No. 1 Lucas, table type, horizontal 3-in. bar.
No. 2 Rockford horizontal.
Bement-Niles R & L table type, horizontal, 3⅞-in. bar.
24-in. and 42-in. Bullard New Era Type.
34-in. Colburn, vertical type, turret head.
48-in. Colburn, 1 regular head, 1 turret head.
54-in. Bullard, rapid production.
62-in. Rogers, 2 heads on rail.
100-in. J. M. Poole, 2 heads on rail.

GRINDERS

No. 1 Brown & Sharpe universal.
12-in.x36-in. Cincinnati Universal.
3-in., 6-in., and 10-in. swing x 18-in., 32-in., 36-in., 50-in. and 72-in. long Norton plain.
No. 10 Brown & Sharpe plain.
10-in.x24-in. Landis plain.
12-in. Pratt & Whitney vertical surface.
No. 16 Blanchard rotary surface, motor driven.
10-in. Garrigus rotary surface.
No. 1 and 1½ Cincinnati complete cutter and tool.
No. 3 Brown & Sharpe cutter and tool.
No. 2 Walker cutter and tool.
No. 13 Brown & Sharpe cutter and tool.
No. 2 Oakley cutter and tool.
Nos. 1 and 2 Norton cutter and tool.
No. 60 Heald cylinder.
No. 70 Heald internal.

GRINDERS—Continued

Taylor high speed water tool.
No. 2 Brown & Sharpe surface, with magnetic chuck.
18-in. and 30-in. Besly disc.

SCREW MACHINES AND TURRET LATHES

No. 0 Brown & Sharpe automatic.
⅜-in., ⅝-in., ⅞-in. Cleveland automatic, Model "B."
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1¾-in. Gridley multiple spindle automatic.
4¼-in. Gridley single spindle automatic motor drive.
⅞-in. and 1-in. Brown & Sharpe and Warner & Swasey wire feed.
1½-in.-2¼-in. Cincinnati-Acme, wire feed.
1½-in. Pratt & Whitney, wire feed.
2¼-in. and 3¼-in. Cincinnati-Acme flat turret, bar and chucking.
2-in. and 3-in. Jones & Lamson flat turret type, bar and chucking equipment.
16-in. and 18-in. Acme and Warner & Swasey Fox turret lathe, with chasing bars.
2-spindle Jones & Lamson flat turret lathe, chucking equipment.
2—No. 23 Prentice automatic chucking machines.
No. 4 Warner & Swasey universal turret lathes.
22-in. Libby turret lathe.

LATHES

Adams short cut manufacturing lathe.
Porter Cable manufacturing lathe.
16-in.x6-ft. LeBlond high duty manufacturing lathe.
16-in.x8ft. Lodge & Shipley manufacturing lathe.
16-in.x8-ft. Automatic Machine Co., threading lathe.
13-in.x6-ft. Willard, C.R., P.C.F.
16-in.x8-ft. Lodge & Shipley C.R., P.C.F.
16-in.x8-ft. LeBlond C.R., P.C.F.
18-in.x16-ft. LeBlond C.R., P.C.F.
18-in.x8-ft. Lodge & Shipley, C.R., P.C.F.
18-in.x8-ft. Lodge & Shipley, C.R., P.C.F., geared head.
22-in.x10-ft. American C.R., P.C.F., geared head.
24-in.x10-ft. Lodge & Shipley C.R., P.C.F.
20-in.x8-ft. American C.R., P.C.F.
24-in.x88-ft. Lodge & Shipley, C.R., P.C.F.

LATHES—Continued

54-in.x24-ft. Old Style lathe, C.R., P.C.F.
24-in.x46-in.x16-ft. Fay & Scott gap lathe.
18-in.-36-in.x8-ft. Fay & Scott gap lathe.
3½-in.x60-in. Lo-Swing lathe.

SHAPERS AND PLANERS

6-in. Pratt & Whitney vertical shaper.
12-in. Smith & Mills, crank shaper.
16-20 and 24-in. Gould & Eberhardt shaper.
16-in. Flather revolving knee, shaper.
18-in. Stockbridge, shaper.
24-in. Cincinnati, shaper.
18x48-in. Niles traveling head, 2 tables, shaper.
15 and 20-in. Hendey friction driven.
24-in.x6-ft. Gray planer, 1 head, belt drive.
36-in.x10-ft. Gray planer, 3 heads, motor drive.
36-in.x12-ft. Cincinnati planer, 4 heads, belt drive.
42-in.x14-ft. Pond planer, 4 heads, belt driven.
54-in.x16-ft. Powell planer, 4 heads, belt drive.
66-in.x12-ft. Pond planer, 2 heads, belt drive.
72-in.x20-ft. Gleason planer, 3 heads, belt drive.

MILLERS

No. 1½ and 2 Cincinnati universal.
No. 2 Hendey universal.
No. 4-A Brown & Sharpe universal high power.
No. 2 Cincinnati plain, cone drive.
No. 2-M Cincinnati plain, high power.
No. 3 Cincinnati plain, high power.
No. 3 Kearney & Trecker, plain high power.
No. 4 Cincinnati plain, high power.
Nos. 3 and 4 Cincinnati vertical, high power.
C-2 Becker vertical, high power.
4½x12-in. Pratt & Whitney, thread type.
No. 0 Van Norman duplex.
No. 2 Warner & Swasey manufacturing.
Pratt & Whitney double spline.
17-in.x8-ft. Beaman & Smith, slab.
28-in. Cincinnati semi-automatic.

MISCELLANEOUS

No. 3 Barber-Coleman Hobbing gear cutter.
18-in. Gould & Eberhardt hobbing gear cutter.
6-in. Gould & Eberhardt, spur & bevel, gear cutter.
100 lb. Bradley Hammer.
8x12-in. Ruesch rolling mill.
52-in Niagara foot power squaring shear.
Nos. 1, 2 and 3 Lapointe broaching machines.

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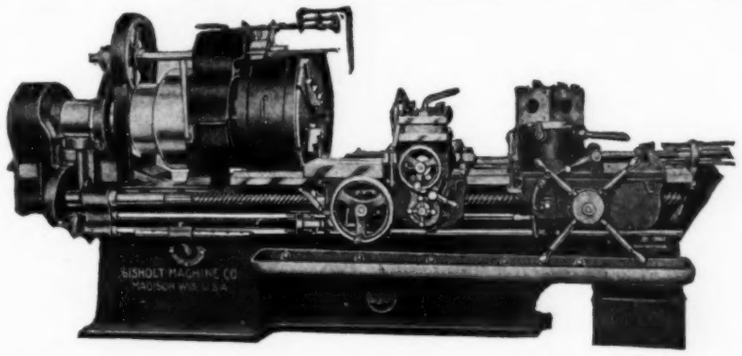

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One 24-in.—2½-in. Spindle Bore
Two 24-in.—4¼-in. Spindle Bore
One 24-in.—5-in. Spindle Bore
One 24-in.—6¼-in. Spindle Bore Lathe

Also One 36-in. Rebuilt Vertical Boring Mill

The above lathes have been entirely rebuilt in our own shop with same jigs and fixtures used when first built. We guarantee them to be as accurate as new machines.

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One 36-in. Vertical Boring Mill.

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Slotter, 26-in. Niles, geared.
Turret Lathe, No. 2-A W & S, gd. hd.
Turret Lathe, 26-in. Libby, 4½-in. hole.
Shear Rotary, No. 134 Lennox Splitting.
Shear Gap, No. 696 Niagara, 10 ga.
Shear Gap, No. 336 Niagara, 10 ga.
Shear, No. 6½ Hilles & J. Gate.
Shear, 8-ft. Stoll Power Sq., 14 ga.
Shaper, 24-in. Milw. B. G. with vise.
Screw Machine, No. 4 W. & S. frie hd.
Punch, S. E., 48-in. Thrt. Rock River.
Punch, S. E., 18-in. Thrt. Hendley & Wh.
Press, No. 4 Rudolph & Krummel S.S. Geared Press 3¼ in. str.
Press, No. 512 Niagara S.S. back gd.
Planer, No. 3, 16-ft. Niles, plate.
Planer, 20x20-in.x4-ft. 3-in. New Haven, 1 hd.
Planer, 42x42-in.x10-ft. Gray, 1 hd.

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Curtis 12-in. Capacity **Pipe Threader**, complete $500
F. B. Shuster ½-in. Capacity **Blow Type Riveter** 125
Chambersburg 200 lb. **Tool Dressing Hammer** 300
60-lb. **Bradley Helve Hammer**, late type 450
No. 3A Heavy Brown & Sharpe **Univ. Miller**, complete 1500
Pratt & Whitney 12-in. **Vertical Surface Grinder** 575
New Haven 34x34-in.x8-ft. Single Head **Planer** with c/s 500

Send for our latest list.

BOTWINIK BROTHERS
"Connecticut Machinery Merchants"
21 Sylvan Ave., New Haven, Conn.
218-42 Drouve St., Bridgeport, Conn.

Western 5-ft. heavy type **Radial Drilling Machine.**

Bullard 51-in. Vertical **Boring Mill.**

No. 3A Universal (Horizontal) **Boring Machine.**

Norton 6x32-in., 10x36-in. and 10x50-in. Plain **Grinders.**

Hendey 16-in. x 8-ft. **Lathe;** compound and taper attachment.

Milwaukee No. 3B Plain **Milling Machine.**

Cincinnati No. 4 Plain High Power **Milling Machine.**

Becker No. 8 Duplex **Milling Machine.**

Forbes 8-in. **Pipe Machine;** hand and power.

Write for Blue List No. 11

Hill, Clarke & Co., Inc.
The Machinery Merchants Since 1864
156 Oliver St., Boston, 9, Mass.

These Bullard Machines May Be Adapted To A Variety Of Work

$100 EACH

F. O. B. Providence R. I.

You can adapt them to do many jobs, such as boring, cutting-off, chucking, etc. We have only a few left. Wire your order now before you miss this wonderful bargain.

The E. A. Eddy Machinery Co.
211 Eddy St., Providence, R. I.

Webster & Perks

Plain and Universal

GRINDING MACHINES

Absolutely New!

Yet priced to compare with used tools.

Universal Machines combine tool-room accuracy with great versatility, rigidity and power for quantity. Plain machine grinds either straight or taper, with extreme accuracy. All machines are brand new, yet are given thorough inspection and test under belt before shipping. A rare bargain at the price.

Send for Circular

Barber-Colman Company
Rockford, Ill., U. S. A.

Surplus Machine Tools

FOR SALE

22-in. x 10-ft. **Draper Engine Lathe,** arranged for motor drive—Reliance Motor.

12-in. x 6-ft. **Speed Lathe,** 4-step cone, single-speed countershaft.

2—Lodge & Shipley 30-in. x 38-ft. **Heavy Forge Lathes,** complete with pan, pump, etc.

1—Lodge & Shipley 30-in. x 56-ft. **Heavy Forge Lathe.**

3—**LeBlond Lathes**—32 ft. long, arranged as riffling machines.

Pratt & Whitney **Thread Miller**—3-in chucking capacity 6 x 126-in. Machine.

3—4-spindle Acme Automatic **Screw Machine,** Motor Drive.

Cleveland Automatic **Shaft Turning Machine,** Model B.

Gridley **Single Spindle Automatic,** 4¼-in. spindle hole.

2—36-in.x22-ft. bed **American Engine Lathes,** geared head, arranged motor drive.

Write for Detailed Information

Gisholt Machine Co.
1200 E. Washington Ave.
Madison, Wis.

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New York, N. Y.

1888 Page Ave.
Cleveland, Ohio

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1—Ingersoll-Rand Two-Stage 23x13x16, belt driven Air Compressor, excellent condition, price $3,000.
1—Sullivan Two-Stage Belt Driven Air Compressor 20x12x16, excellent condition, price $2,400.
1—Ingersoll-Rand Two-Stage 19x12x16 Compressor, arranged for belt drive, excellent condition, price $2,675.
1—Ingersoll-Rand Single-Stage 14x12 Air Compressor, excellent condition, price $1,400.
1—Ingersoll-Rand Two-Stage Air Compressor, Imperial Type Ten, right steam cylinder 19x14; left steam cylinder 12x14; air cylinders 12x14; 60 lb. working pressure. Excellent condition. Price, $1,875.
1—Rand Drill Co. Imperial Type Ten Compressor, two-stage, r. h. air cylinder 29x26; l. h. air cylinder 17x26; steam cylinders 26x26, practically new. Price $3,850.

Myers Machine Tool Corporation
Columbia, Pa., U. S. A.

FOR SALE

OVEN FURNACES

American Gas Co.'s 3—No. 22. 1—No. 77. Size of heating space about 50x108-in., entrance opening about 12x20-in., will sell any of above for $100.00 each.

METAL STAMPING COMPANY,
13th St. & Boulevard,
LongIsland City, N. Y.

High Grade Tools

1—18-in. **Libby Turret Lathe,** excellent condition $1200

1—17-D 3-spindle **Moline Hole Hog Drill,** 1 5/16 cap., like new.... 500

1—No. 1½ **Cincinnati Plain Miller,** self-contained, positive geared feed box, excellent condition... 450

1—No. 4 **Foster Screw Machine,** 42 collets, 15 box tools, excellent condition 650

Asher Machinery Co.
49-51-53 Mechanic St., Newark, N. J.

Electric Welders

150 amp. General Electric.
300 amp. 2-circuit Wilson.
600 amp. 4-circuit Wilson.

Fine Condition. Bargain Prices.

MILES MACHINERY CO., Saginaw, Mich.

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25 BROWN & SHARPE

No. 00 Turret forming machines.
No. 00, No. 0, No. 2 and No. 2-G full automatic screw machines.
2—No. 2 Brown & Sharpe hand screw machines.
1—Bausch 42-in. vertical boring mill, two heads, cone driven.

Noble Machinery Co., Inc.
Phone Canal 4083 237-239 Lafayette St., N. Y.

Notice to Advertisers

Owing to the Holiday—Independence Day, Friday, July 4th—the "*Searchlight*" pages of the July 10th issue of

American Machinist

will close for press a day earlier than usual.

Changes of Copy

and new advertisements for the July 10th issue should therefore reach us by

10 A.M. Wednesday, July 2nd

TOOLS FOR IMMEDIATE SHIPMENT

1—4½ & 2½-ft. Mueller Radial.
2—2-ft. Mueller Radials.
1—24x24x 8 Cincinnati Planer.
1—36x36x 9 Openside Detrick-Harvey.
1—32x32x 8 Cincinnati Planer.
1—36x36x10 Pond, two heads.
1—15-in. Hendey Friction Shaper.
1—16-in. New Whipp, cone drive.
1—20-in. Hendey, friction driven.
1—20-in. Gould-Eberhardt Shaper.
1—24-in. American, A-1 condition.
1—24-in. Stockbridge Shaper.
1—24-in. Bement Slotter.
2—16x 6 Springfield Tool Room Lathe.
1—16x 8 Sidney Geared Hd. New.
1—18x 8 Springfield DBG Lathe.
1—18x 8 Hendey Geared Head Lathe.
1—18x10 Sidney Geared Hd. New
1—24x12 Prentice DBG Lathes.
1—25x10 LeBlonde DBG Lathe.
1—26x22 Boye-Emmes, motor drive.
1—27x15 Bridgeford Axle Lathe.
1—36x16 N-B-Pond Gd. Head Lathe.
1—36x18 Bridgeford SPD Lathes.
1—60x18 Pond Screw Cutting Lathe.
1—48x15 Pond Screw Cutting Lathe.
1—48x56 N-B-P Lathe, two carriages.
1—New No. 11 Natco Mult. Spd. Drill.
1—New No. 13 Natco Mult. Spd. Drill.
1—New No. 14 Natco equipped with spot facing attch.
1—New No. 30 Natco Tapping Attch., 42-spindles.
1—No. 39 Natco 12-spindles, No. 2 Morse Taper Drills.
5—No. 41 Natco 12-spindles, Vert. Table.
1—No. 2-A Landis Plain Grinder.
1—24x12 Modern Plain Grinder.
3—No. 60 Heald Cylinder Grinder.
1—No. 13 Brown-Sharpe Univ. Cut. Grinder.
1—No. 4 Gardner Double Disc Grinder.
1—No. 11 Besley Disc Grinder, 2 tables.
1—No. 18 Besley Double Disc Grinder.
1—No. 5 B & S Univ. Grinder, 20x72.
1—No. 4 Cincinnati Universal Grinder.
1—No. 3 Modern Univ. Grinder, 13x40.
1—No. 6 Diamond Disc Grinder.
1—No. 9 Van Norman Internal Grinder.
1—5x18 Ott Plain Grinder.
1—6x32 Norton Plain Grinder.
2—No. 1-B Milwaukee Universal Millers.
1—No. 2 Cincinnati Universal Miller.
1—No. 2½ Rockford Univ. Miller.
1—No. 1 Cleveland Plain Miller. New.
1—No. 2 Cleveland Plain Miller. New.
1—No. 2-B Milwaukee Plain Miller.
1—No. 2 Kempsmith Plain Miller.
1—No. 2 Cincinnati Vertical Miller.
1—No. 3 LeBlonde Plain Miller.
1—No. 3 Brown-Sharpe Plain Miller.
1—No. 3-B Hendey Plain Miller.
1—No. 5 Cincinnati Plain Miller.
1—No. 13 Garvin Plain BG Miller.
1—Bogart Duplex Miller, 9½x49.
1—No. 32 Kempsmith Plain Miller.
1—No. 3 Cincinnati Vertical Miller.

Write for Simmons Pictorial News

1205 Troy Road

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Buffalo, N. Y.
84 Exchange St.

New York City,
180 Lafayette St.

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440 Ton, Waterbury-Farrel, Knuckle Joint, Steel Frame

No. 1½B Bliss, Toggle, Friction Clutch
No. 64 V & O, Geared, 9 in. Stroke
No. 69 N, Bliss, Inc., D. A. Geared
No. 20 Perkins, 96 in. Bet. Ups., Geared
No. 21 Bliss, Inc. Geared or Flywheel
No. 5RG54 Ferracute, 52 in. Bet. Ups, Geared
No. 4D Bliss, 54 in. Bet. Ups, Flywheel

Large assortment of Inclinable, Single and Double Action, Toggles, Double and Single Crank, Straight Side Geared and Flywheel Presses.

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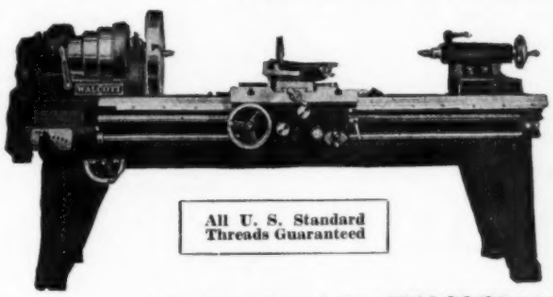

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14x 6	14x 8	14x10
16x 6	16x 8	16x10
18x 8	18x10	
18x12	20x 8	20x10
20x12	26x 8	26x10
26x14	26x16	29x20

Several of each size in stock.

40—100% Brand New WALCOTT LATHES

Latest Type—Quick Change Gears—Some with Taper Attachment—Fully Equipped.
Guaranteed as to Accuracy, Workmanship, Etc.
Unusual Good Features—Double Apron, All Steel Gears, etc.
Reported by many users to be exceptionally good lathes.
Builders of Lathes Since 1881. For Full Details, Illustrated Catalogs, Low Prices, Etc., Write, Wire or Call.

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HENRY & WRIGHT

CLASS K—adjustable tables and adjustable spindles—

SENSITIVE DRILLS

one, two, three, four, five, and six spindle machines

Priced Extremely Low Before Removal

MACHINERY DEALERS, Inc.
419 Chapel St., New Haven, Conn.

A Few Bargains in Used Tools

BORING MILLS
30 and 36-in. BULLARDS, 3-jaw chuck tables.

RADIAL DRILLS
2½ and 3½-ft. BICKFORD plain, gearbox.
6-ft. GANG, gearbox drive, tap. attachment.

GEAR CUTTERS
No. 12 BARBER-COLEMAN gear hobber.
No. 6 FELLOWS gear shaper.
16-in. CINCINNATI gear hobber.

GRINDERS
No. 6 BESLEY disc, 2-spindle, r.w. chucks.
No. 34 VAN NORMAN auto. bore grinder.
14x56-in. NORTON plain grinder.

LATHES
25-in.x14-ft. SIDNEY, q.c.g., c.r.
32-in.x18-ft. BRADFORD, c.r.

SCREW MACHINES AND TURRET LATHES.
No. 1-B, No. 2-B, No. 3-B FOSTER geared head.
21 and 24-in. GISHOLT.

Send for Complete List

STOCKER-RUMELY-WACHS CO.
119 N. Jefferson St., Chicago, Ill.

Bullard Vertical Turret Lathes

24-in. Rapid Production.
24-in. New Era.
36-in. New Era (2).

A-1 Condition. Money-Back Guarantee.

MILES MACHINERY CO., Saginaw, Mich.

GOOD USED TOOLS

4-ft. Cincinnati-Bickford Motor Driven Radial Drill.
No. 2 Knight Vertical Milling and Drill Machine.
No. 3 LeBlond Plain Milling Machine, with vertical attachment.
No. 2 Rockford Universal Milling Machine, with vertical attachment.
No. 3 Kempsmith Universal Milling Machine.
72-in.x39-ft. Fifield Triple Geared Engine Lathe.
24-in.x12-ft. Schumacher & Boye Engine Lathe.
22-in.x12-ft. New Mueller Engine Lathe.
No. 75½ Bliss Straight Side Press, with side shear attachment.
60x60-in.x16-ft. Detrich & Harvey Open Side Planer, three heads.
72x72-in.x14-ft. Sellers Planer, three heads.

The O'Brien Machinery Co.
113 N. Third Street, Philadelphia, Pa.
Long Distance Telephone: Market 0727
Cable Address: OBRIEN Phila.

Special Selections

NOT EASILY DUPLICATED

8—Cisco 16-in.x6-ft. Lathes, quick change gear, some with taper and relieving attachments, 90% new.
2—Prentiss 3-ft. and 4-ft. Plain Radial Drills, gear box single pulley drive.
1—Baxter D. Whitney No. 23 Cylinder Grinder, 90% new.
1—Persons-Arter 8-in. Rotary Grinder, with magnetic chuck.
1—Williams No. 16-B Pipe Threading Machine. Capacity 7½ to 16 in., arranged for motor drive, 90% new.
1—Damon Heavy Duty Double Back Geared, Belt Driven Cold Shear, with 24-in. throat, will cut 2½-in. squares, weight about 20,000 lbs.
1—Beloit No. 54 Punch and Shear, with architectural jaw and angle cutting attachment. Capacity ¾ in. through ¾ in.
2—Bullard 24-in. and 51-in. Vertical Boring Mills.

JOSEPH BEAL & CO.
465-471 Atlantic Ave., Boston 9, Mass.

Partial List Of

"The Best In Used Machine Tools"

No. 8 **Bardon & Oliver** Turret Lathe Cap. 2¼-in.
16-in.x10-ft. **Lodge & Shipley** Tool Room. (2)
20-in.x16-ft. **LeBlond** Engine Lathe, belt dr.
24-in.x12-ft. **Lodge & Shipley** Q.C.G., T.A. (2)
24-in.x18-ft. **LeBlond** Motor Driven Lathe.
28-in. x 12-ft. **Boye & Emmes** Q.C.G., Lathe, taper attachment.
36-in. x 20-ft. **Bradford** Lathe, Triple Geared Face Plate Drive, taper attachment.
48x48-in.x14-ft. **Powell** Reversing Motor Driven Planer, four heads.
36x30-in.x16-ft. **Whitcomb-Blaisdell** Planer.

COST CUTTERS!

17-in. x6-ft. **LeBlond** Rapid Production Lathes
3- and 4-ft. **American** Sensitive Radial Drills
No. 52 **Acme** Multiple Spindle Automatic.
No. 1 **LaPointe** Broaching Machines (2)
3 ½-in. x60-in. **Loswing** Lathe, two carriages.
36x24-in. x10-ft. **Newton** Slab Miller.
44-in. **Putnam** Vertical Boring Mill, single pulley drive, turret head.
36-in.x36-inx10-ft. **Cincinnati** Planer, 4 heads.
Pratt & Whitney Multiple Spindle, drill cap. twelve 1¼ in. drills within 26 in. square.

Ready for Immediate Use.

42-in. **Bullard** Vertical Boring Mills.
10-in. **Betts** Slotter, belt drive.
16-in. **Davis Back** Geared **Crank** Shaper.
3 ½-ft. **Prentice** Plain Radial Drill.
2½-ft. **Mueller** Plain Heavy Duty Radial.
4-ft. **Mueller** Plain H. D. Radial Motor Driven.
24-in. **Cincinnati Bickford** Upright.
Sliding Head Drill Presses. (10)
No. 2B **Brown & Sharpe** Plain Miller.
4x30-in. **Pratt & Whitney** Cylindrical Grinder.
10x36-in. **Norton** Plain Cylindrical Grinders.
14x50-in. **Norton** Plain Cylindrical Grinder.
No. 60 **Heald** Cylinder Grinder Serial No. 1846.
No. 65 **Heald** Cylinder Grinder Serial No. 398.
1100 lb. N-B-P Steam Forging Hammer.
4—6—8 and 10-in. Pipe Machines.

SEND FOR our 64-page **JUNE** booklet of the largest stock in the United States of slightly used, thoroughly overhauled and guaranteed **Machine Tools, Power, Electrical and Contractors' Equipment.**

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F. H. NILES & CO., Inc.
Claremont and West Side Avenues,
JERSEY CITY, N. J.
"Satisfaction Guaranteed or Money Refunded"
ESTABLISHED 1900.

NOW'S THE TIME TO BUY—AT LOW PRICES!

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1—No. 3 CINCINNATI Univ.—like new.
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1—No. 2 LEBLOND Plain—late type.
20—BECKER, KEMPSMITH, HENDEY Lincoln Type, No. 14, No. 32, No. 4, sizes.
15—BRIGGS type "A" Prod. with 16 in. feeds.
1—24-in. QUEEN CITY B.G. (NEW).
15—ROCKFORD, P. & J., SELLEW and DAVIS 14, 15 and 16 in. (all NEW).
2—14 and 16 in. GOULD & EBERHARDT b.g.

GOOD LATHES ONLY

10—PRATT & WHITNEY Bench Lathes, 7x32 in. with thread-cutting attachments.
3—RIVETT No. 608 Precision Bench Lathes, B.G. screw cutting, some with collets.
7—100% New at reduced prices, SENECA FALLS Lathes, all sizes, 11x4 to 13x10.
10—DAVIS 12x5 and 14x6, Q.C.G. Lathes, with and without T.A., all NEW.
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1—25x12 LEBLOND, Q.C.G., full 28-in. swing.
1—16x 8 AMERICAN Q.C.G., with T.A.
1—PORTER-CABLE Prod., with facing att.
50—WALCOTT Q.C. Gear Lathes—(NEW). 14 to 29 in. swing, by 6 to 20 ft. long. Send for illustrated circulars, prices, etc.
25—Other good lathes, used, all sizes and makes.

SCREW MACHINES, ETC.

1—GRIDLEY 1¾ in., 4 sp. AUTO., complete.
4—DEFIANCE No. 4 g.f.h., all NEW.
4—100% new BARDONS & OLIVER No. 2 Turrets, f.g. hd., p.f. to turret, 1-in. cap.
1—PIPE MACHINE—12 in. Saunders—latest.
30—DRILL PRESSES, 1, 2, 3, 4 and 6 sp. high speed ALLEN, HENRY & WRIGHT, AVEY.
5—CYL. GRINDERS, No. 60 Heald, like new.
3—GRINDERS, Norton, 3x18, self-cont.
1—CHUCKING GRINDER, No. 20 Bryant
2—Univ. Grinders, No. 13 and No. 3, B.&S.
1—BROACHER No. 1 J. N. LaPointe, s.p.d.
4—GEAR CUTTERS—No. 3, 26-in. B. & S.
1—FOX No. 0 DRILL—12 sp. Multiple Sp.

Only Part of Our Complete Stock Listed
Complete details—lowest prices—on request.

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A. LAMBERG & CO., 241-245 Centre St., New York City

A Boring Mill, Slotter, Cylinder Grinder?

51-in. Bullard Double Head Vertical Boring Mill, capacity 40-in. height, vertical movement of tool bars 26 in., ten changes table feed, plain table.
6-in. Newton Machine Tool Works' Slotting Machine, max. stroke 6½ in. Never used.
Used No. 60 Heald Cylinder Grinder, single pulley, gear box drive, ball bearing spindles, each having work holding fixtures. A-1 condition.

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BROWN & SHARPE No. 00 Full Automatic Screw Machines

Guaranteed 90% new, Serial Numbers 6705, 6711, 6712, 6714, 6785, 6789, 6934. Full Standard B & S equipment, ready for immediate operation.

For further particulars write or wirg:

JOSEPH BEAL & CO.
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No. 0 BROWN & SHARPE AUTOMATIC SCREW MACHINES

$550.00 Each

MACHINERY DEALERS, Inc.
419 Chapel St., New Haven, Conn.

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VERTICAL BORING MILLS

36-in.-44-in. Niles Side Head, 220 v., D.C.

51-in. Niles Boring and Turning Mill with 1 swivel head and 1 turret head.

60-in. Bement, 2 swivel heads, belt drive.

10-ft. Niles, heavy, 2 heads, 220 v., D.C.

Niles-Bement-Pond Co.
111 Broadway, New York.

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Stokvis Brand New Tools

Over 500 tools sold
Write for complete list

ENGINE LATHES
18x8 South Bend
20x10 Flather
20x12 Greaves Klusman

R. S. STOKVIS & SONS, INC.
17 Battery Place, New York
Telephone: Whitehall 1737

(8)

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Band Saw, Metal, 12-in. capacity
Bending Rolls, 8-ft. 3-in. Plate
Boring Mill, 54-in. and 60-in. Colburn, 2 heads
Drill, 32 in. Hamilton, sliding head
Drills, Sensitive, 1, 2, 3, 4 and 6 spindles
Grinder, 6x32 Norton, 10x36 Landis plain
Inclinable Press, Robinson O. B., No. 1 ½ in.
Lathe, LeBlond, 13 in. x 5 ft., collet attachment
Lathes, 27 in. x 10 ft. Bridgeford, heavy duty
Miller, Bilton, No. 25, plain
Miller, Briggs, Type "A"
Oil Separator, Springfield
Pipe Machines, 2, 4, 6 and 12 in.
Planer, Pond, 44x44 in. x 12 ft. 4 hd.
Plate Grinders, Yates, 36 and 66-in.
Radial, Morris, 3-ft. plain, cone drive
Shaper, 24-in. Barker, back geared, crank
Shear, 5-ft. Robinson for 10 gauge
Turret Lathe, Tilted, 1 ½ in., power feed
Universal Grinder, W. & P., 10x30 in.
New 3-phase Motors, 5-hp. $67.50 3-hp. $57.50.

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Columbus, Ohio

Ideal Specials

New 14-in. Blount wet tool grinders. Bargain prices

8-in. Parsons-Arter rotary grinders, A-1 condition, $450.00 each.

IDEAL MACHINERY CO.
Plainville, Conn., U. S. A.

(2)

1—Niles Horizontal Boring Mill $850
1—Aurora 28-in. Drill with Box Table 375
1—P & W No. 3 Die Sinker 800
1—Waterbury Farrell Slitter 275
1—No. 2 Van Norman Miller 850

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286 Courtland Avenue, P. O. Box 3054
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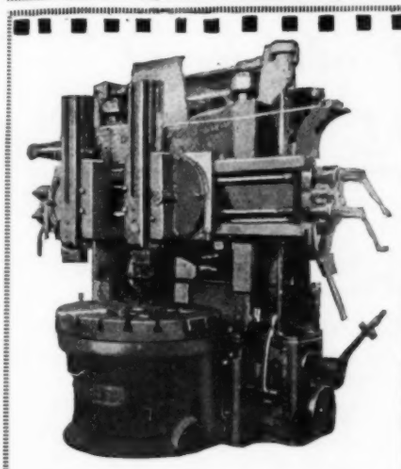
SPECIALS

Brand New 12 in. x 5 ft. Vernon Engine Lathes, Q.C.G. High Grade, Special Price

14-in.x10-ft. **Hendey Lathe.**
18-in.x14-ft. **Prentice Bros. Lathe.**
42-in.x20-ft. **Lodge & Shipley Patent Head Lathe.**
2-spindle Leland-Gifford 14-in. **B. B. Upright Drill.**
3-spindle **Cincinnati H. S. B. B. Upright Drill.**
5-spindle 16-in. **Henry & Wright H. S. B. B. Upright Drill.**
No. 34A 3-spindle **Demco H. S. B. B. Bench Drill.**
3-ft. **Prentice Plain Radial Drill.**
No. 6 **Whitney Hand Millers.**
Thurston Die Miller.
No. 25 **Bilton Back Geared Plain Millers.**
No. 1M **Potter & Johnston Automatic Miller.**
17x17-in.x 4-ft. **Whitcomb Planer.**
26x30-in.x14-ft. **Whitcomb-Blaisdell Planer.**
42x54-in.x14-ft. **Gray Planer,** three heads.
16-in. **Smith & Mills Plain Shaper.**
28-in. **Hendley Friction Shaper.**
No. 3 **Wilmarth & Morman Surface Grinder.**
No. 1 **Greenfield Universal Cutter and Reamer Grinder.**
No. 31 **Sidney Universal Woodworker.**
36-in. **Sidney Band Saw.**
18-in. **Crescent Jointer.**
No. 4 **Greenerd Arbor Press.**
Rockford Shaft Straightener, capacity 3 in.
6x6 **Peerless Power Hack Saw Machine.**

BROWNELL MACHINERY CO.
11 Eddy Street, Providence, R. I.



Coburn Boring Mill

1—42 in. Coburn Boring Mill, motor driven, 95% new.

JAMES A. CONDON, Inc.
N. W. cor. Third and Arch Sts.
Philadelphia, Pa.

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In original Packages

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9/16, 11/16, 13/16, 15/16, ⅞, 1 1/16, 1 3/16, 1 5/16, 1¼, 1½, 2, 2 1/16, 2 5/16, 2⅜.

Disc. 40-10.

CAP SCREWS MILLED

HEX

SAE	SAE
30000—½ x2	22000—¼ x1
27000—½ x2 ⅛	22000—½ x2 ¼
30000—½ x2 ½	11000—½ x1 ¼

Disc. 85-10

TAPS—U. S. S.

Greenfield—Winters	P. & W.
7 Sets 7/16	12 Sets 1 ⅜
8 Sets ⅞	23 Sets 1 ½
33 Sets 1	10 Sets 1 ¾
13 Sets 1 ⅛	1 Set 3

Disc. 50%-10%

Fuller Doran Hardware Corp.
38 Nepperham St., Yonkers, N. Y.

Prompt Attention to All Orders.

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Real Values in Rebuilt Tools

42-in.x20-ft. Pond Lathe L.C., tripled gd.
36-in.x14-ft. Putnam Semi-quick Change Lathe, tripled geared.
24-in.x12-ft. Rahn & Marmon Quick Change Lathe, with taper.
24-in.x12-ft. Davis Loose Change Lathe.
20-in.x12-ft. Bradford Quick Change Lathe.
19-in.x10-ft. R. K. LeBlond Heavy Duty Quick Change Lathe, pract. new.
18-in.x10-ft. Greaves & Klusman Quick Change Lathe.
16-in.x8-ft. Seneca Falls Quick Change Lathe, with taper.
14-in.x6-ft. Lodge & Shipley Quick Change Lathe.
14-in.x6-ft. Bradford Quick Change Tool Room Lathe, with taper, relieving and draw in collets attachments.
2½-ft. Cincinnati Bickford Plain Radial Drill, gear box drive.
2½-ft. Morris Plain Radial Drill, gear box drive.
4-ft. American Tool Works Plain Radial Drill, gear box drive.
4-ft. Western Plain Radial Drill, gear box drive.
5-ft. Niles, Bement & Pond Full Universal Radial, gear box drive.
4-ft. Almond High Speed Ball Bearing Sensitive Drill, with tapping.
28-in. Aurora Upright Drill, with B.G. and P.F.
26-in. Cincinnati Bickford Upright Drill, gear box drive, with B.G. and P.F.
24-in. Reed Prentice Upright Drill, gear box drive, with B.G. and P.F.
22½-ft. Barnes Upright Drill, with B.G. and P.F.
20-in. Barnes Four Spindle Gang Drill, with auto. approach and return feeds.
No. 2 Cincinnati Universal Miller, cone type, complete.
No. 3 Cincinnati Universal Miller, cone type, complete.
No. 3-B Milwaukee (Kearney & Trecker) Plain Miller, single pulley.
No. 3 Kempsmith Plain Miller, cone type.
No. 2-B Brown & Sharpe Plain Miller, single pulley.
No. 20 Oesterlein (Ohio) Plain Miller, cone type.
18-in. Cincinnati Plain Miller, cone pulley.
No. 6 Whitney Hand Miller.
16-in. Hendey Friction Geared Shaper.
20-in. Smith & Mills Back Geared Crank Shaper.
20-in. American Tool Works Back Geared Crank Shaper.
24-in. Cincinnati Back Geared Crank Shaper.
24-in. Gould & Eberhardt Back Geared Crank High Duty Shaper, gear box motor drive, with motor, automatic down feed. Practically new.
26x26-in.x6-ft. Cincinnati Planer, with two heads, belt drive.
42x42-in.x26-ft. Cincinnati Planer, with two heads, belt drive.
1½-in. Landis Bolt Cutter, with lead screw attachment.
No. 21 Lucas Horizontal Boring Mill, gear box with 2¾-in. bar.
No. 4, 48-in. Brown & Sharpe Auto. Gear Cutter.
No. 70 Heald Internal Grinder.
No. 60 Heald Cylinder Grinder, complete, serial No. 1470.
10x30-in. Landis Plain Cylindrical Grinder.
No. 6 Long & Allstatter Dble End Punch and Shear, cap. ½ through ½ in.
No. 2A Warner & Swasey Hollow Hex Universal Turret Lathe, geared head, with large spindle 3¼ in.
13-in. Gisholt Turret Lathe, cone pulley, with taper.
No. 4 Millholland Turret Screw Machine, capacity 1⅝ in. through spindle.
National Electric Spot Welder, capacity two pieces of ¼-in. metal.

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Motor Drive.

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No. 2 **Warner & Swasey Hand Screw Machine.**
15-in. **Smith & Mills Shaper.**
2-spindle **Allen B. B. Drill.**
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11-in.x 5-ft. **Star Lathe.**
20-in.x10-ft. **Greaves-Klusman Lathe.**
24-in.x14-ft. **New Haven Lathe.**

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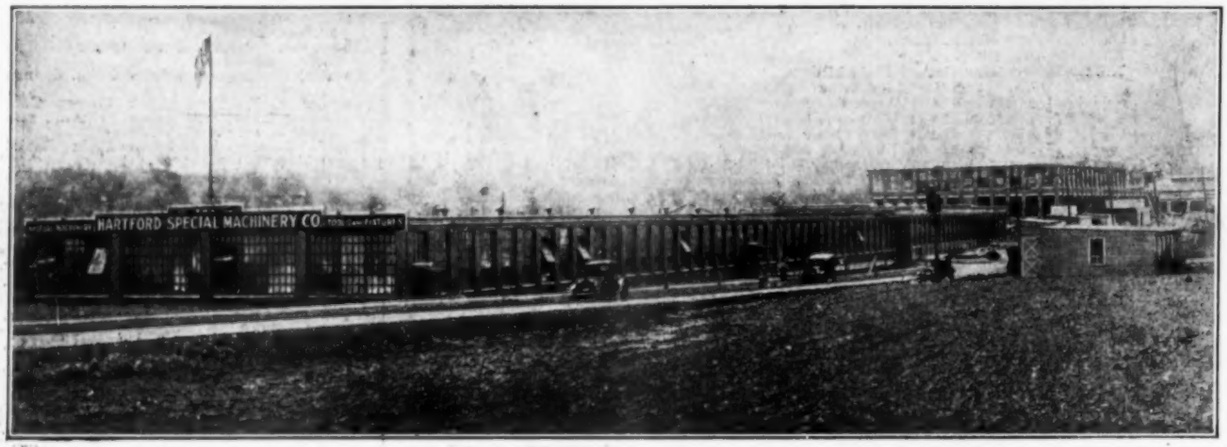

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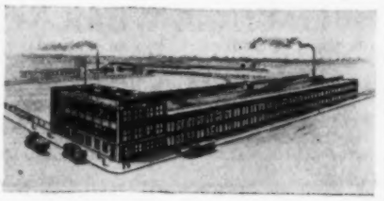

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For Alphabetical Index See Last Page

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Carborundum Co., Niagara Falls

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Norton Co., Worcester
Safety Emery Wheel Co., Springfield, O.

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Watson-Stillman Co., N. Y.

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Chicago Pneu. Tool Co., N. Y.

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Nicholson & Co., W. H., Wilkes-Barre
Rockford Milling Mch. Co., Rockford
Union Mfg. Co., New Britain
Union Twist Drill Co., Athol
Whitney Mfg. Co., Hartford

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New Departure Mfg. Co., Bristol

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Abbott Ball Co., Hartford
Auburn Ball Bearing Co., Rochester
New Departure Mfg. Co., Bristol

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Abbott Ball Co., Hartford

Bars, Boring
Gisholt Mach. Co., Madison
Underwood Corp., H. B., Phila.

Bars, Bronze Cored
Bunting Brass & Bronze Co., Toledo

Bearings, Babbitt
Franklin Die Casting Corp., Syracuse

Bearings, Ball
Auburn Ball Bearing Co., Rochester
Bearings Co. of America, Lancaster
Boston Gear Wks., Norfolk Downs
New Departure Mfg. Co., Bristol
Norma Co. of America, N. Y.
Schatz Mfg. Co., Poughkeepsie
Strom Ball Bearing Mfg. Co., Chicago

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Doehler Die Cast. Co., Brooklyn

Bearings, Die-Cast
Doehler Die Cast. Co., Brooklyn
Franklin Die Cast. Corp., Syracuse

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Hoggson & Pettis Mfg. Co., New Haven

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Wroe, C. I., N. Y. C.

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Haskins Co., R. G., Chicago
LeBlond Mach. Tool Co., R. K., Cincinnati

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Jones Fdry. & Mch. Co., W. A. Chicago

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Link Belt Co., Chicago-Phila.
Morse Chain Co., Ithaca
Ramsey Chain Co., Albany
Whitney Mfg. Co., Hartford

Belting, Leather
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Schieren Co., Chas. A., N. Y.

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Brown & Sharpe Mfg. Co., Providence

Benches, Work
Niagara Mch. & T. Works, Buffalo

Bending Machines Power
Long & Allstatter Co., Hamilton
Niagara Mach. & Tool Wks., Buffalo
Ryerson & Son, Jos. T., Chicago

Bending & Straightening Mchs.
Cons. Mach. Tool Corp., Rochester
Niles-Bement-Pond Co., N. Y. City

Blocks, Chain (See Hoists, Hand)

Blocks, Pillow
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American Gas Furnace Co., Elizabeth
Buffalo Forge Co., Buffalo
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Greenfield Tap & Die Corp., Greenfield
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Pawtucket Mfg. Co., Pawtucket
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Cincinnati Planer Co., Cincinnati
Cons. Mach. Tool Corp., Rochester
Gisholt Mach. Co., Madison
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Niles-Bement-Pond Co., N. Y.
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Cons. Mach. Tool Corp., Rochester
Gisholt Mach. Co., Madison
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Lucas Mach. Tool Co., Cleveland
Moline Tool Co., Moline
Murchey Mch. & Tool Co., Detroit
Niles-Bement-Pond Co., N. Y. City
Pawling & Harnischfeger Co., Milwaukee
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Sellers & Co., Wm., Philadelphia
Sommer & Adams Co., Cleveland, O.
Universal Boring Mch. Co., Hudson
Springfield (O.) Mach. Tool Co.
Vandyck Churchill Co., N. Y.

Boring, Drilling and Milling Mach., Vertical
Knight Mchy. Co., W. B., St. Louis
Pawling & Harnischfeger Co., Milwaukee

Boring Heads
Lovejoy Tool Co. Inc., Springfield, Vt.

Boring Tools
Armstrong Bros. Tool Co., Chicago
Lovejoy Tool Co. Inc., Springfield, Vt.

Boxes, Tote (See Furniture, Machine Shop)

Broaches
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson

Broaching Machines
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson
Oilgear Co., Milwaukee
Pawtucket Mfg. Co., Pawtucket

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Bunting Brass & Bronze Co., Toledo
Brown & Sharpe Mfg. Co., Providence
Harris & Co., Arthur, Chicago

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Bunting Brass & Bronze Co., Toledo

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Link-Belt Co., Chicago-Phila.

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Bulldozers
Long & Allstatter Co., Hamilton

Burners, Oil and Gas
Advance Furnace & Eng. Co., Springfield, Mass.
Johnson Gas Appliance Co., Cedar Rapids

Bushings
Bunting Brass & Bronze Co., Toledo

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Armstrong Bros. Tool Co., Chicago

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Bellefleur & Son Co., A. C. New London
Brown & Sharpe Mfg. Co., Providence
Randall & Stickney, Waltham
Starrett Co., L. S., Athol
Slocomb Co., J. T., Providence

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Garvin Machine Co., N. Y.
Rowbottom Mach. Co., Waterbury

Cams
Rowbottom Mach. Co., Waterbury

Can-Making Machinery (See Sheet Metal Working Machinery)

Carbonizing Machines
American Gas Furnace Co., Elizabeth

Case Hardening & Tempering
Bennett Metal Treating Co., Elmwood

Castings, Aluminum
Bunting Brass & Bronze Co., Toledo
Doehler Die Cast. Co., Brooklyn
Quincy Fdry. & Nov. Co., Quincy

Castings, Brass and Bronze
Bunting Brass & Bronze Co., Toledo
Doehler Die Cast. Co., Brooklyn
Imperial Brass Mfg. Co., Chicago
Pangborn Corp., Hagerstown

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Doehler Die Cast. Co., Brooklyn
Franklin Die Cast. Corp., Syracuse

Castings, Iron
Amer. Bldg. Fdry. Co., Chicago
Brown & Sharpe Mfg. Co., Providence
Chapman Co., W. H., Middletown
Etna Machine Co., Toledo
Franklin Mach. Co., Providence
Link-Belt, Chicago, Phila.
Reed-Prentice Co., Worcester
Springfield (O.) Mach. Tool Co.

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Pangborn Corp., Hagerstown
Springfield (O.) Mach. Tool Co.

Centering Machines
Hanson-Whitney Co., Hartford
Niles-Bement-Pond Co., N. Y. City
Pawling & Harnischfeger Co., Milwaukee
Pratt & Whitney Co., N. Y. City
Rockford Milling Mch. Co., Rockford
Whiton Mch. Co., D. E., New London

Centers, Planer
Cincinnati Planer Co., Cincinnati

Chains (See Sprockets and Chains)

Chains, Driving
Diamond Chain & Mfg. Co. Indianapolis
Duckworth Chain & Mfg. Co. Springfield
Link-Belt Co., Chicago-Phila.
Morse Chain Co., Ithaca
Philadelphia Gear Wks., Phila.
Ramsey Chain Co., Albany
Whitney Mfg. Co., Hartford

Chucking Machines
Brown & Sharpe Mfg., Co., Providence
Bullard Mach. Tool Co., Bridgeport
Cleveland (O.) Auto Mach. Co.
Gisholt Mach. Co., Madison
Goss & De Leeuw Mach. Co., New Britain
Jones & Lamson Mach. Co., Springfield, Vt.
Potter & Johnston Mch. Co., Pawtucket

Chucks, Air
Frontier Chuck & Tool Co., Buffalo

Chucks, Centering
Cushman Chuck Co., Hartford
Thomas Elev. Co., Chicago

Chucks, Collet
Ney Co., J. M., Hartford
Rockford Milling Mch. Co., Rockford

Chucks, Drill and Tap
Almond Mfg. Co., T. R., Ashburnham
Brown & Co., R. H., New Haven
Cons. Mach. Tool Corp., Rochester
Cushman Chuck Co., Hartford
Errington Mech. Laboratory, N. Y.
Manufacturers Equip. Co., Chicago
Marvin & Casler Co., Canastota
Morse Twist D. & M. Co., New Bedford
Skinner Chuck Co., New Britain
Thomas Elev. Co., Chicago
Union Mfg. Co., New Britain.
Victor Tool Co., Waynesboro.
Wahlstrom Tool Co., Brooklyn
Westcott Chuck Co., Oneida, N. Y.
Whitney Mfg. Co., Hartford.
Whiton Mch. Co., D. E., New London

Chucks, Lathe
Almond Mfg. Co., T. R., Ashburnham
Bullard Mach. Tool Co., Bridgeport.
Cushman Chuck Co., Hartford
Gisholt Mach. Co., Madison
Hoggson & Pettis Mfg. Co., New Haven
Mfgrs. Equip. Co., Chicago
Ney Co., J. M., Hartford
Skinner Chuck Co., New Britain
Thomas Elev. Co., Chicago
Union Mfg. Co., New Britain
Wahlstrom Tool Co., Brooklyn
Westcott Chuck Co., Oneida, N. Y.
Whiton Mch. Co., D. E., New London

Chucks, Magnetic
Heald Mach. Co., Worcester
Walker Co., O. S., Worcester

Chucks, Planer
Cincinnati Planer Co., Cincinnati.
Hoggson & Pettis Mfg. Co., New Haven
Skinner Chuck Co., New Britain
Union Mfg. Co., New Britain

Chucks, Quick Changing
Errington Mech. Laboratory, N. Y.
Geometric Tool Co., New Haven
National Tool Co., Cleveland
Ney Co., J. M., Hartford
Thomas Elev. Co., Chicago
Whitney Mfg. Co., Hartford

Chucks, Split
Ames Co., B. C., Waltham.
Rivett Lathe & Grinder Corp., Boston
Stark Tool Co., Waltham

Chucks, Vertical Boring Mill
Bullard Mach. Tool Co., Bridgeport
Gisholt Mach. Co., Madison

Chucks, Wrenchless
Thomas Elevator Co., Chicago

Clamps, Machinists'
Armstrong Bros. Tool Co., Chicago.
Reed Mfg. Co., Erie.
Starrett Co., L. S., Athol

Cleaners, Metal, Waste, General
Oakley Chemical Co., N. Y.

Clocks, Time
Gisholt Mach. Co., Madison

Clutches, Friction
Brown Co., A. & F., N. Y.
Brown Eng. Co., Reading
Johnson Mach. Co., Carlyle, Manchester.
Jones Fdry. & Mch. Co., W. A. Chicago
Link-Belt Co., Chicago-Phila.
Moore & White Co., Philadelphia

Coal & Ash Handling Machinery
Link-Belt Co., Chicago-Phila.
Shepard Elec. C. & H. Co., Montour Falls

Coal Storage Systems
Link-Belt Co., Chicago-Phila.

Showing a Hardened Metallic Drive Screw being driven into cast iron. The Screw is so hardened that it cuts into the material without stripping or injuring its thread.

Better Fastenings

to Steel, Cast Iron, Brass, Aluminum, Bakelite, etc.

Quicker—Easier

Hardened Metallic Drive Screws are fast displacing machine screws, escutcheon pins, etc., for attaching nameplates and for making other permanent assemblies to steel, cast iron, etc.

For 3 good reasons:

(1) They eliminate the costly tapping operation involved in the use of machine screws—effecting savings in time and labor as high as 75%.

(2) They hold better than machine screws or escutcheon pins—vibration can't loosen them.

(3) They're easier to use—only 3 simple operations.

More than 2500 manufacturers including concerns like the General Electric Co., The Westinghouse Electric & Mfg. Co., The Black & Decker Mfg. Co., The Hoover Co., Ford Motor Co., and hundreds of others as prominent are using these Screws profitably. Perhaps you can, too. *It will cost you nothing to investigate. Send for samples and full information.*

PARKER-KALON CORPORATION
360 West 13th St., New York, N. Y.

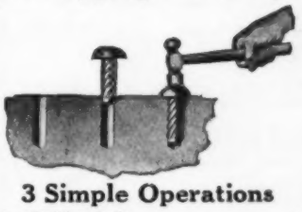
Agents for British Isles:
Charles Churchill & Co., Ltd., Finsbury, London E.C. 2, England

Parker-Kalon
Hardened Metallic
Drive Screws

(Pat. Jan. 29, 1924)

Driven Like a Nail—Holds Like a Screw

No Tapping Necessary!



3 Simple Operations

1—Drill a hole.
2—Insert the tip of the screw.
3—Drive it home with a hammer. Just as simple and easy as driving a nail in a piece of wood.

Collars, Shaft or Set
Standard Pressed Steel Co., Phila.

Collars, Spacing
Detroit Stamping Co., Detroit.

Collets
Brown & Sharpe Mfg., Co., Providence
Geometric Tool Co., New Haven
Ney Co., J. M., Hartford
Rivett Lathe & Grinder Corp., Boston
Union Twist Drill Co., Athol
Whitney Mfg. Co., Hartford

Compounds, Carbonizing Casehardening and Tempering
Bennett Metal Treating Co., Elmwood
Rogers & Hubbard Co., Middletown
Shore Instrument & Mfg. Co., N. Y.

Compounds, Cleaning
Oakley Chemical Co., N. Y.

Compounds, Cutting, Drawing, Drilling, Grinding
Oakley Chemical Co., N. Y.
Stuart & Co., Inc., D. A., Chicago
White & Bagley Co., Worcester

Compressors, Air and Gas
Black & Decker Mfg. Co., Baltimore
Chicago Pneu. Tool Co., N. Y.
General Electric Co., Schenectady
Ingersoll-Rand Co., N. Y. C.
Sachsenmaier Co., Geo., Phila.
Sullivan Machinery Co., Chicago

Compressors, Electric
Black & Decker Mfg. Co., Baltimore

Conduit Interior
General Electric Co., Schenectady

Cones, Friction
Evans Fric. Cone Co., Newton Highlands

Contract Work
Amer. Die & Tool Co., Reading
Ames Co., B. C., Waltham
Automatic Wrench Co., West N.Y.
Barber-Colman Co., Rockford
Boston Scale & Machine Co., Boston
Brock, Jr., T. & M. Wks., Arthur, Phila.
Brown & Co., R. H., New Haven
Brown & Sharpe Mfg. Co., Providence
Columbus (O.) Die T. & Mch. Co.
Corcoran, Inc., A. J., Jersey City
Detroit Stamping Co., Detroit.
Die Tool & Mach. Co., Columbus
Dyett Co., Frank J., Illion
Earle Gear & Mach. Co., Phila.
East. Mch. Screw Corp., New Haven
Franklin Mch. Co., Providence.
Garvin Mach. Co., N. Y.
Gisholt Mach. Co., Madison
Grant Mfg. & Mch. Co., Bridgeport
Hartford Special Mchy. Co., Hartford
Hillside Tool & Die Co., Hillside, N. J.
Keller Mech. Eng. Co., Brooklyn
Lenney Bros., Warren
Lambert & Todd Mch. Co., Camden.
Lincoln Mach. Co., Pawtucket
Lincoln Mfg. Co., Maywood, Ill.
Long & Altslatter Co., Hamilton
Massillon Fdry. & Mach. Co., Massillon
Mathews, Hugh, Kansas City
Mehl Mach. T. & D. Co., Roselle
Meisel Press Mfg. Co., Boston
Miner-Robey Mfg. & Tool Wks., Milwaukee
Moseley Lathe Co., Chicago, Ill.
Niles-Bement-Pond, N. Y. C.
Penney & Sons Co., J. W., Mechanics Falls
Pittsburgh Inst. & Mach. Co., Pittsburgh
Poorman, J. E., Philadelphia
Pressed Metal Co., Springdale, Pa.
Rockford Iron Works, Rockford
Rowbottom Mach. Co., Waterbury
Simplex Tool Co., Woonsocket
Steel Products Eng. Co., Springfield, Ohio
Superior Tool & Stamping Co., Cleveland, O.
Sweet & Doyle Fdry. & Mach. Co. Troy.
Thompson Grinder Co., Springfield, O.
Underwood Corp., H. B., Philadelphia
Wald Mfg. Co., Maysville, Ky.
Waltham Mch. Wks., Waltham
White Dental Mfg. Co., S. S., N.Y.C.
Wicaco Screw & Mach. Wks., Phila.

Controllers & Starters, Elec.
General Elec. Co., Schenectady
Industrial Controllers Co., Milwaukee

Converters
General Elec. Co., Schenectady

Conveyors
Link-Belt Co., Chic.-Phila.

Conveyors and Elevators (See Brass Rods)
Counterbores
National Tool Co., Cleveland
National Twist D. & T. Co., Detroit
Pratt & Whitney, Hartford
Slocomb Co., J. T., Providence

Countershafts
Brown & Sharpe Mfg., Co., Providence
Diamond Mch. Co., Providence
Evans Fric. Cone Co., Newton Highlands
Garvin Mach. Co., N. Y.
Pratt & Whitney, Hartford
Standard Pressed Steel Co., Phila.

Counters, Revolution
Bristol Co., Waterbury
Veeder Mfg Co., Hartford

Countersinks
Greenfield Tap & Die Corp., Greenfield

Counting Machines
Hart Mfg. Co., R. A., Battle Creek
Veeder Mfg Co., Hartford

Counting and Printing Wheels
Doehler Die Casting Co., Brooklyn.
Franklin Die Cast Corp., Syracuse

Coupling Hose, Universal
Chicago Pneu. Tool Co., N. Y.

Couplings, Flexible
Brown Engineering Co., Reading
Dexter Co., I. H., Goshen
Foote Bros. Gear & Mach. Co. Chicago
James Mfg. Co., D. O., Chicago
Jones Fdry. & Mch. Co., W. A. Chicago

Couplings, Rigid
Jones Fdry. & Mch. Co., W. A. Chicago

Couplings, Shaft
Almond Mfg. Co., T. R., Ashburnham
Dexter Co., I. H., Goshen
Foote Bros. Gear & Mach. Co., Chicago
Johnson Mach. Co., Carlyle, Manchester
Nicholson Co., W. H., Wilkes-Barre
Standard Pressed Steel Co., Phila.

Cranes, Electric (See Hoists and Cranes, Electric)

Cranes, Locomotive
Link-Belt Co., Chic.-Phila.

Cranes, Traveling
Barrett-Cravens Co., Chicago
Canton Fdry. & Mch. Co., Cant
Link-Belt Co., Chicago-Phila.
Manning, Maxwell & Moore, Inc., N. Y. C.
Niles-Bement-Pond, N. Y. C.
Pawling & Harnischfeger Co., Milwaukee
Reading Chain IBock Corp., Reading
Shepard Elec. C. & H. Co., Montour Falls
Whiting Corp., Harvey

Crank Pin Turning Machines
Reed-Prentice Co., Worcester
Underwood Corp., H. B., Phila.

Crusher, Chip
American Crusher Mchy. Corp., N. Y. C.

Cut-outs, Elect.
General Elec. Co., Schenectady

Cutters, Gear
Brown & Sharpe Mfg., Co., Providence
National Tool Co., Cleveland
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol

Cutters, Keyseater
Davis Keyseater Co., Rochester

Cutters, Milling
Barber-Colman Co., Rockford
Cowles Tool Co., Cleveland, O.
Geometric Tool Co., New Haven
Ingersoll Mill. Mch. Co., Rockford
Lovejoy Tool Co. Inc., Springfield, Vt.
Morse Twist Drill & Mch. Co., New Bedford.
National Tool Co., Cleveland
National Twist D. & T. Co., Detroit
Pratt & Whitney, Hartford
Reed-Prentice Co., Worcester
Sommer & Adams Co., Cleveland
Union Twist Drill Co., Athol
Whitney Mfg. Co., Hartford

Cutters, Reclaimed
National Grinding Co., Detroit

Cutters, Thread
Rivett Lathe & Grinder Corp., Boston

Cutting-Off Machines
Armstrong-Blum Mfg. Co., Chicago.
Armstrong Bros. Tool Co., Chicago.
Brown & Sharpe Mfg. Co., Providence
Earle Gear & Mach. Co., Phila.
Etna Machine Co., Toledo
Garvin Mach. Co., N. Y.
Gorton Mach. Co., Geo., Racine
Greenfield Tap & Die Corp., Greenfield
Niles-Bement-Pond Co., N. Y. City
Vandyck Churchill Co., N. Y.

Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago
Pratt & Whitney Co., N. Y. City

Cutting Oil Filters (See Oil Filtering Systems)

Dealers, Machinery (See Searchlight Section)
Allen Co., Inc., H. F., N. Y. C.
Asher Mchy. Corp., Newark
Beal & Co., Jos., Boston
Botwinik Bros., New Haven
Brownell Machy Co., Dayton
Condon, Inc., James A., Phila.
Eastern Mchy. Co., Phila.
Eddy Machy. Co., E. A., Providence
Electric Welding Sup. & Sales Co., Boston
Essley Mach. Co., E. L., Chicago
Froiland Mfg. Co., Springfield, Ill.
Gisholt Mach. Co., Madison
Hill, Clarke & Co., Inc.
Hill, Clarke & Co., Chicago.
Hyman & Sons, Jos., Philadelphia
Ideal Mchy. Co., Plainsville
Lamberg & Co., A., N. Y.
Lynd-Farquhar Co., Boston
Machinery Dealers, Inc., New Haven
Miles Mchy. Co., Saginaw
Morey & Co., N. Y.
New Jersey Machy. Ex., Newark
Niles & Co., F. H., Jersey City
Niles-Bement-Pond, N. Y.
Noble Machy. Co., N. Y. C.
O'Brien Mchy. Co., Phila.
Osborne & Sexton Mchy. Co., Columbus
Prentiss & Co., Henry, N. Y.
Simmons Mach. Tool Corp., Albany
Stocker-Lumely-Wacho Co., Chicago
Stokvis & Sons, R. S., N. Y.
Wickes Mchy. Co., Jersey City.

Demagnetizers
Luma Elect. Equip. Co., Toledo
Walker Co., O. S., Worcester

Diamond Tools
Desmond-Stephan Mfg. Co., Urbana
Dickinson, Thomas L., N. Y.
Wheel Trueing Tool Co., Detroit

Die Making Machines
Anderson Die Mch. Co., Bridgeport
Haskins Co., R. G., Chicago
Keller Mech. Eng. Co., Brooklyn
White Dental Mfg. Co., S.S., N. Y. C.

Die Sets
Danly Mach. Spec., Inc.

Die Sinking Maps
Pratt & Whitney Co., N. Y. City
Dies & Die Cutting
Interstate Mach. Lab., N. Y. C.
Newark Die Co., Newark

Dies, Forging
Keller Mech. Eng. Co., Brooklyn
Steel Products Eng. Co., Springfield, O.

Dies, Self-opening Adjustable
Cons. Mach. Tool Corp., Rochester
Eastern Mch. Screw Corp., New Haven
Geometric Tool Co., New Haven
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mch. Co., Waynesboro
Murchey Mchy. & Tool Co., Detroit
Victor Tool Co., Waynesboro

Dies, Sheet Metal and Sub-Press (See Tool Work)

Dies, Threading-Opening
Eastern Mch. Screw Corp., New Haven
Geometric Tool Co., New Haven
Greenfield Tap & Die Corp., Greenfield
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mch. Co., Waynesboro
Murchey Mchy. & Tool Co., Detroit
National Acme Co., Cleveland
National Machinery Co., Tiffin, field, O.
Victor Tool Co., Waynesboro
Steel Products Eng. Co., Spring-

Dividing Heads
Knight Mchy. Co., W. B., St. Louis
U. S. Mch. Tool Co., Cincinnati

Dogs, Lathes & Milling Machines
Armstrong Bros. Tool Co., Chicago

Dressers, Grinding Wheel
Bay State Stamping Co., Worcester
Desmond-Stephan Mfg. Co., Urbana
Norton Co., Worcester

Drill Holders
Armstrong Bros. Tool Co., Chicago

Drill Rods
Lancaster Steel Products Corp., Lancaster, Pa.

Drill Speeders
Graham Mfg. Co., Providence

Drilling Machine Heads
Hoefer Mfg. Co., Freeport.
Langelier Mfg. Co., Cranston
U. S. Drill Head Co., Cincinnati

Drilling Machines, Automatic
Baker Bros., Toledo
Fox Mach. Co., Jackson, Mich.
Langelier Mfg. Co., Cranston
Nat'l Automatic Tool Co., Richmond

Drilling Machines, Auto
Rockford Milling Mch. Co., Rockford

Drilling Machines, Bench
Ames Co., B. C., Waltham
Clark Elec. Co., Jr., Jas., Louisville
Henry & Wright Mfg. Co., Hartford
Hoefer Mfg. Co., Freeport
Langelier Mfg. Co., Cranston
Sigourney Tool Co., Hartford
Silver Mfg. Co., Salem
Taylor & Fenn Co., Hartford.

Drilling Mach. Elec. & Pneu.
Ingersoll-Rand Co., N. Y. C.

Drilling, Machines, Gang
Baker Bros., Toledo
Barnes Drill Co., Rockford
Cincinnati (O.) Bickford Tool Co.
Foote-Burt Co., Cleveland
Fosdick Mch. Tool Co., Cincinnati
Henry & Wright Mfg. Co., Hartford
Langelier Mfg. Co., Cranston
Moline Tool Co., Moline
Prest-O-Lite Co., N. Y.
Rockford (Ill.) Drilling Mach. Co.
Silver Mfg. Co., Salem
Taylor & Fenn Co., Hartford

Drilling Machines, Heavy Duty
Baker Bros., Toledo
Barnes Drill Co., Inc., Rockford
Cons. Mach. Tool Corp., Rochester
Foote-Burt Co., Cleveland
Fosdick Mch. Tool Co., Cincinnati
Hoefer Mfg. Co., Freeport
Minster Mch. Co., Minster
Ryerson & Son, Joseph T., Chicago

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle
Baker Bros., Toledo
Cons. Mach. Tool Corp., Rochester
Detroit Mach. Tool Co., Detroit
Foote-Burt Co., Cleveland
Fox Mach. Co., Jackson, Mich.
Langelier Mfg. Co., Cranston
National Acme Co., Cleveland
Nat'l Automatic Tool Co., Richmond
Niles-Bement-Pond Co., N. Y. City
Pratt & Whitney Co., N. Y. City
Rockford (Ill.) Drilling Mach. Co.
Sellers & Co., Wm., Philadelphia
Sigourney Tool Co., Hartford

Drilling Machines, Radial
American Tool Wks. Co., Cincinnati
Cincinnati (O.) Bickford Tool Co.
Dreses Mch. T. Co., Cincinnati
Fosdick Mach. Tool Co., Cincinnati
Henry & Wright Mfg. Co., Hartford
Morris Mch. Tool Co., Cincinnati
Muller Mch. Tool Co., Cincinnati
Niles-Bement-Pond, N. Y. C.
Reed-Prentice Co., Worcester
Ryerson & Son, Joseph T., Chicago
Sellers & Co., Wm., Philadelphia

Drilling Machines, Sensitive
Ames Co., B. C., Waltham
Henry & Wright Mfg. Co., Hartford
Langelier Mfg. Co., Cranston
Leland Gifford Co., Worcester
Sigourney Tool Co., Hartford
Taylor & Fenn Co., Hartford
U. S. Mch. Tool Co., Cincinnati
Wisconsin Elect. Co., Racine

Drilling Machines, Turret
Nat'l Automatic Tool Co., Richmond

Drilling Machines, Vertical
Aurora Tool Co., Aurora
Baker Bros., Toledo
Barnes Drill Co., Inc., Rockford
Buffalo Forge Co., Buffalo
Cincinnati (O.) Bickford Tool Co.
Foote-Burt Co., Cleveland
Fosdick Mch. Tool Co., Cincinnati
Henry & Wright Mfg. Co., Hartford
Hoefer Mfg. Co., Freeport
Knight Mchy. Co., W. B., St. Louis
Langelier Mfg. Co., Cranston
Leland-Gifford Co., Worcester
Ryerson & Son, Jos. T., Chicago
Silver Mfg. Co., Salem
Taylor & Fenn Co., Hartford
U. S. Mch. Tool Co., Cincinnati

Drills, Center
Gledhill Mfg. Co., Providence
Morse Twist D. & M. Co., New Bedford
National Twist D & T. Co., Detroit

Drills, Portable, Electric & Pneumatic
Black & Decker Mfg. Co., Baltimore
Chicago Pneumatic Tool Co., N. Y.
Clark Elec. Co., Jr., Jas., Louisville
Hisey-Wolf Mach. Co., Cincinnati
Neil & Smith Elec. T. Co., Cincinnati
Silver Mfg. Co., Salem
Slocomb Co., J. T., Providence
Union Twist Drill Co., Athol
U. S. Elec. Tool Co., Cincinnati
Wisconsin Elect. Co., Racine

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For every type of sheet-metal operation

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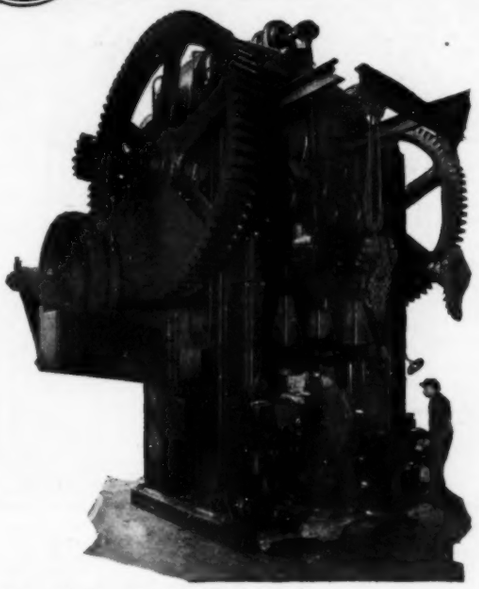

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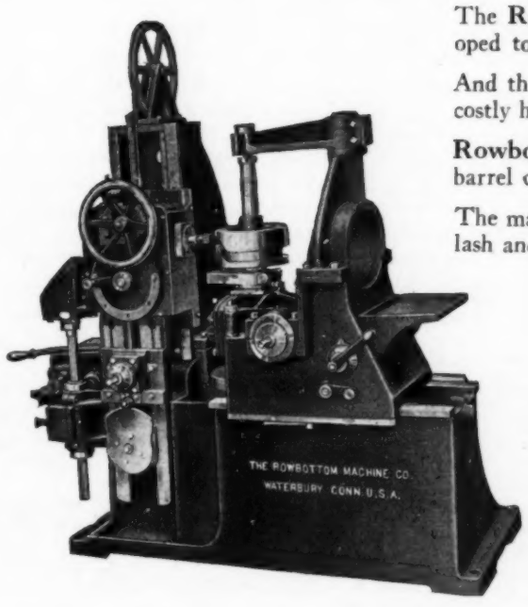
Assures consistently good cams to exact shape



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And that means, to the *closest of precision standards,* minus the usual costly hand "touching up."

Rowbottom cut Cams are ready for assembler. Box—face—side or barrel cams cut with equal facility.

The master cam method plus a force feed mechanism eliminates backlash and the usual errors in contour.

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Waterbury, Conn.
Factory at Waterville, Conn.

Rowbottom for Cams

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., N. Y. City
Union Twist Drill Co., Athol

Drills, Twist and Flat
Buckeye Twist Drill Co., Alliance
Morse Twist D. & M. Co., New Bedford
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol

Electrical Instruments
General Electric Co. Schenectady
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Electrical Supplies
General Electric Co. Schenectady
Simplex Wire & Cable Co., Boston
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Elevating Trucks (See Trucks)

Elevators
Atlantic Elevators Co., Phila.
Link-Belt Co., Chic.-Phila.

Emery Wheels (See Grinding Wheels)

Engineers, Industrial and Mechanical
Hartford Special Mchy. Co., Hartford
Underwood Corp., H. B., Philadelphia

Engines, Oil, Gas and Steam
Chicago Pneu. Tool Co., N. Y.
Ingersoll-Rand Co., N. Y. C.

Engraving Machinery
Gorton Mach. Co., Geo., Racine
Keller Mech. Eng. Co., Brooklyn
Reed- Prentice Co., Worcester

Expanders, Tube
Watson-Stillman Co., N. Y.

Eyeglass, Safety (See Goggles, Safety)

Fans, Electric
General Electric Co. Schenectady
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Fans, Exhaust
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Fans, Ventilating
General Electric Co. Schenectady
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Files and Rasps
American Swiss File & Tool Co., Elizabeth
Delta File Works, Philadelphia

Filing Machines
Ames Co., B. C., Waltham
Cochrane-Bly Co., Rochester
Haskins Co., R. G., Chicago
Oliver Instrument Co., Adrian
White Dental Mfg. Co., S.S., N. Y. C.

Filler, Iron (See Cement, Iron)

Fittings, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Flexible Shafts and Shafting
Haskins Co., R. G., Chicago
White Dental Mfg. Co., S.S., N. Y. C.

Forging Machinery
Acme Mchy. Co., Cleveland
Bradley & Son, C. C., Syracuse
National Mchy. Co., Tiffin

Forgings, Drop
Bearings Co. of America, Lancaster
Midwest Forge & Steel Co., E. St. Louis
Universal Mach. Co., Bowling Green

Foundry Equipment
Atkins & Co., E. C., Indianapolis

Fuel Oil Burning System
Advance Furnace & Eng. C Springfield, Mass.
Chicago Flexible Shaft Co., Chicago

Furnaces, Forging
American Gas Furnace Co., Elizabeth
Chicago Flexible Shaft Co., Chicago

Furnaces, Heat-Treating
Advance Furnace & Eng. Co., Springfield, Mass.
American Gas Furnace Co., Elizabeth
American Industrial Furnace Corp., Boston
Brown & Sharpe Mfg. Co., Providence
Chicago Flexible Shaft Co., Chicago
Johnson Gas Appliance Co., Cedar Rapids
Strong, Carlisle & Hammond Co., Cleveland

Furnaces, Tempering and Annealing
Advance Furnace & Eng. Co., Springfield, Mass.
American Gas Furnace Co., Elizabeth
Brown & Sharpe Mfg. Co., Providence
Chicago Flexible Shaft Co., Chicago
Johnson Gas Appliance Co., Cedar Rapids
General Electric Co., Schenectady
Strong, Carlisle & Hammond Co., Cleveland

Furnaces & Ovens
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Furniture, Machine Shop
Angle Steel Stool Co., Otsego
Brown Eng. Co., Reading

Gage Blocks, Precision
Pratt & Whitney Co., Hartford

Gages, Comparator
Federal Products Corp., Providence
Jones & Lamson Mach. Co., Springfield, Vt.

Gages, Dial
Ames Co., B. C., Waltham
Brown & Sharpe Mfg. Co., Providence
Federal Products Corp., Providence
Randall & Stickney, Waltham
Starrett Co., L. S., Athol

Gages, Plug & Ring
Bath & Co., John, Worcester
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney Co., Hartford

Gages, Recording
Bristol Co., Waterbury

Gages, Snap, Thread and Cylindrical
Bath & Co., John, Worcester
Brown & Sharpe Mfg. Co., Providence
Federal Products Corp., Providence
Greenfield Tap & Die Corp., Greenfield
Hanson-Whitney Co., Hartford
Pratt & Whitney Co., Hartford

Gages, Standard
Brown & Sharpe Mfg. Co., Providence
Federal Products Corp., Providence
Greenfield Tap & Die Corp., Greenfield
Hartford Special Mchy. Co., N. Y. C.
Pratt & Whitney Co., N. Y. C.

Gear Cutting Machines
Adams Co., Dubuque
Barber-Colman Co., Rockford
Bilgram Mch. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Gear Cut. Mch. Co.
Fellows Gear Shaper Co., Springfield, Vt.
Flather Co., Nashua
Garvin Mch. Co., N. Y.
Gleason Works, Rochester
Gould & Eberhardt, Newark
Newark Gear Cut. Mch. Co., Newark
Niles-Bement-Pond Co., N. Y. City
Waltham Mch. Wks., Waltham
Whiton Mch. Co., D. E., New London

Gear Materials
Continental Fibre Co., Newark
General Elect. Co., Schenectady

Gear Tempering Machinery
Gleason Works, Rochester

Gear Testing Machinery
Brown & Sharpe Mfg. Co., Providence
Gisholt Mach. Co., Madison
Gleason Works, Rochester
Newark Gear Cut Mch. Co., Newark

Gears, Cast
Brown Co., A. & F., N. Y.
Brown & Sharpe Mfg. Co., Providence
Franklin Die Cast Corp., Syracuse
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Mch. Co., W. A. Chicago
Link-Belt Co., Chicago-Phila.
Philadelphia Gear Wks., Phila.

Gears, Cut
Albaugh-Dover Co., Chicago
Atlantic Elevator Co., Philadelphia
Bilgram Mch. Wks., Philadelphia
Boston Gear Wks., Norfolk Downs
Brown Co., A. & F., N. Y.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Gear Co.
Connecticut Gears, Inc., Waterbury
Diefendorf Gear Corp., Syracuse
Earle Gear & Machine Co., Phila.
Fawcus Mch. Co., Pittsburgh
Fellows Gear Shaper Co., Springfield, Vt.
Flather Co., Nashua
Foote Bros. Gear & Mach. Co., Chicago
Ganschow Co., Wm., Chicago
Garvin Mch. Co., N. Y.
General Elect. Co., Schenectady
Gleason Works, Rochester
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland
James Mfg. Co., D. O., Chicago
Jones Fdy. & Mch. Co., W. A., Chicago
Link-Belt Co., Chicago-Phila.
Meacham Gear Corp., Syracuse
Meisel Press Mfg. Co., Boston
Meisselbach-Catucci Mfg. Co., Newark
Newark Gear. Cut. Mch. Co., Newark
Niles-Bement-Pond, N. Y. C.
Nuttall Co., R. D., Pittsburgh
Perkins Appliance Co., Springfield Mass.
Philadelphia Gear Wks., Phila.
Simonds Mfg. Co., Pittsburgh
Stahl Gear & Mach. Co., Cleveland
Union Gear & Mach. Co., Boston
Wappot Gear Wks., Pittsburgh, Pa

Gears, Forged
Philadelphia Gear Wks., Phila.

Gears, Molded
Franklin Die Casting Corp., Syracuse

Gears, Reduction for Motors
Stahl Gear & Mach. Co., Cleveland

Gears, Speed Reducers
Foote Bros. Gear & Mach. Co., Chicago
James Mfg. Co., D. O., Chicago
Niles-Bement-Pond, N. Y. C.

Generators, Electric
General Elec. Co., Schenectady
Reliance Elect. & Eng. Co., Cleveland
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Grab Buckets
Link-Belt Co., Chicago-Phila.

Greases, Lubricating
White & Bagley Co., Worcester

Grinding Machines, Ball Bearing Race (See Grinding Machines, Radial)

Grinding Machines, Bench
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Clark Elec. Co., Jr., Jas., Louisville
Diamond Mch. Co., Providence
Greenfield Tap & Die Corp., Greenfield
Harris Eng. Co., Bridgeport
Haskins Co., R. G., Chicago
Marschke Mfg. Co., Indianapolis
Norton Co., Worcester
Ransom Mfg. Co., Oshkosh
Ryerson & Son, Jos. T., Chicago
Safety Emery Wheel Co., Springfield, Ohio
Union Twist Drill Co., Athol
U. S. Elec Tool Co., Cincinnati
Walker Co., O. S., Worcester

Grinding Machine Centerless
Cincinnati Milling Mach. Co., Ohio
Detroit Mach. Tool Co., Detroit

Grinding Machines, Chaser
Geometric Tool Co., New Haven
National Acme Co., Cleveland

Grinding Machines, Chucking
Blanchard Mch. Co., Cambridge
Bryant Chuck Grind. Co., Springfield, Vt.
Heald Machine Co., Worcester
Landis Tool Co., Waynesboro
Rivett Lathe & Grinder Corp., Boston

Grinding Machines, Cutter and Reamer
Armstrong Bros. Tool Co., Chicago
Barber-Colman Co., Rockford
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Diamond Mch. Co., Providence
Gallmeyer & Livingston Co., Grand Rapids
Garvin Mach. Co., N. Y.
Gisholt Mach. Co., Madison
Greenfield Tap & Die Corp., Greenfield
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
LeBlond Mch. Tool Co., R. K., Cincinnati
Middlesex Mch. Co., Div. New Haven Sherardizing Co., New Haven
Norton Co., Worcester
Reed Prentice Co., Worcester
Safety Emery Wheel Co., Springfield, O.
Sellers & Co., Wm., Philadelphia
Taylor & Fenn Co., Hartford
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Cylindrical
Brown & Sharpe Mfg. Co., Providence
Bryant Chuck Grind Co., Springfield Vt.
Cincinnati Grinder Co., Cincinnati
Cons. Mach. Tool Corp., Rochester
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
Norton Co., Worcester
Pratt & Whitney Co., N. Y. City
Rivett Lathe & Grinder Corp., Boston
Sanford Mfg. Co., F. C., Bridgeport
Union Twist Drill Co., Athol
Walker Co., O. S., Worcester

Grinding Machines, Die
Abrasive Mch. T. Co., E. Providence
Bignall & Keeler Mch. Wks., Edwardsville
Blanchard Mach. Co., Cambridge
Diamond Mch. Co., Providence
Geometric Tool Co., New Haven
Heald Mch. Co., Worcester
Murchey Mch. & T. Co., Detroit
National Acme Co., Cleveland
National Mchy. Co., Tiffin
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Disc
Besly & Co., Chas. H., Chicago
Diamond Mch. Co., Providence
Graham Mfg. Co., Providence
Rowbottom Mach. Co., Waterbury

Grinding Machines, Drill
Gallmeyer & Livingston Co., Grand Rapids
Greenfield Tap & Die Corp., Greenfield
Safety Emery Wheel Co., Springfield, O.
Sellers & Co., Wm., Philadelphia
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Face
Abrasive Mch. T. Co., E. Providence
Blanchard Mach. Co., Cambridge
Detroit Machine Tool Co., Detroit
Diamond Mch. Co., Providence
Graham Mfg. Co., Providence

Grinding Machines, Floor
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Diamond Mch. Co., Providence
Norton Co., Worcester
Ransom Mfg. Co., Oshkosh
Royersford Fdry. & Mach. Co., Royersford
Ryerson & Son, Jos. T., Chicago
Safety Emery Wheel Co., Springfield, O.

Grinding Machines, Gage
Abrasive Mch. T. Co., E. Providence
Landis Tool Co., Waynesboro
Middlesex Mch. Co., Div. New Haven Sherardizing Co., New Haven
Rivett Lathe & Grinder Corp., Boston
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Internal
Bryant Chuck Grind Co., Springfield Vt.
Cincinnati Grinder Co., Cincinnati
Garvin Mach. Co., N. Y.
Greenfield Tap & Die Corp., Greenfield
Heald Machine Co., Worcester
Hjorth Lathe & Tool Co., Boston
Landis Tool Co., Waynesboro
Middlesex Mch. Co., Div. New Haven Sherardizing Co., New Haven
Rivett Lathe & Grinder Corp., Boston
Walker Co., O. S., Worcester

Grinding Machines, Portable
Armstrong-Blum Mfg. Co., Chicago
Black & Decker Mfg. Co., Baltimore
Chicago Pneu. Tool Co., N. Y.
Clark Elec. Co., Jr., Jas., Louisville
Haskins Co., R. G., Chicago
Ingersoll-Rand Co., N. Y. C.
Neil & Smith Elec. T. Co., Cincinnati
U. S. Elec. Tool Co., Cincinnati
White Dental Mfg. Co., S.S., N. Y. C.
Wisconsin Elect. Co., Racine

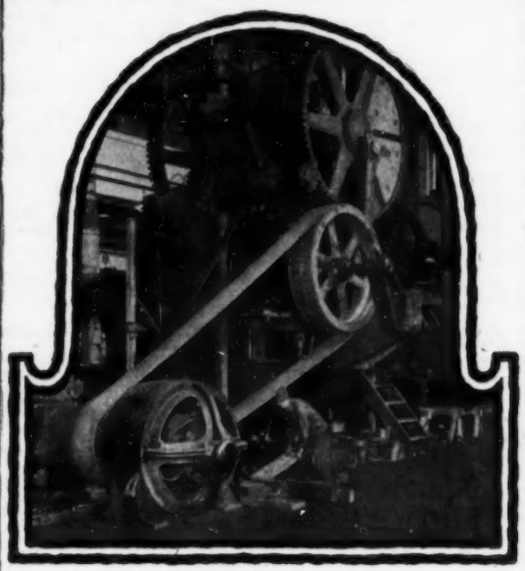
Grinding Machines, Radial
Landis Tool Co., Waynesboro
Rivett Lathe & Grinder Corp., Boston

Grinding Machines, Ring Wheel
Besly & Co., Chas. H., Chicago
Diamond Mch. Co., Providence
Walker Co., O. S., Worcester

Grinding Machines, Snagging
Blount Co., J. G., Everett
Diamond Mch. Co., Providence
Ransom Mfg. Co., Oshkosh
U.S. Elect. Tool Co., Cincinnati

Grinding Machines, Surface
Abrasive Mch. T. Co., E. Providence
Blanchard Mch. Co., Cambridge
Brown & Sharpe Mfg. Co., Providence
Detroit Machine Tool Co., Detroit
Diamond Mch. Co., Providence
Graham Mfg. Co., Providence
Heald Mach. Co., Worcester
Norton Co., Worcester
Pratt & Whitney, Hartford
Reed Prentice Co., Worcester
Rowbottom Mach. Co., Waterbury
Safety Emery Wheel Co., Springfield, O.
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Chicago Pneu. Tool Co., N. Y.
Cincinnati Grinder Co., Cincinnati
Gallmeyer & Livingston Co., Grand Rapids
Gisholt Mach. Co., Madison
Greenfield Tap & Die Corp., Greenfield
Landis Tool Co., Waynesboro.
Middlesex Mch. Co., Div. New Haven Sherardizing Co., New Haven



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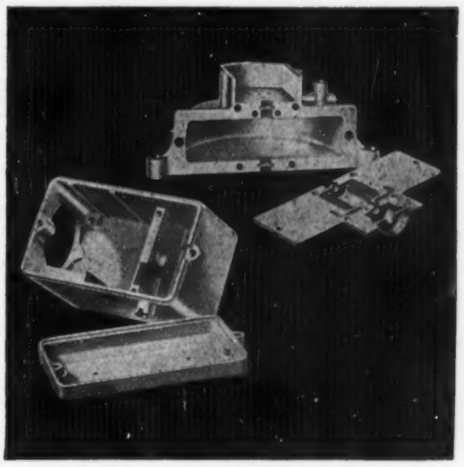

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Norton Co., Worcester.
Wilmarth & Morman Co., Grand Rapids.

Grinding Wheels.
Carborundum Co., Niagara Falls
Norton Co., Worcester
Safety Emery Wheel Co., Springfield, O.

Hammers, Drop
Bradley & Son, C. C., Syracuse
Niles-Bement-Pond Co., N. Y. City

Hammers, Pneumatic
Chicago Pneu. Tool Co., N. Y.
Ingersoll-Rand Co., N. Y. C.

Hammers, Power
Bliss Co., E. W., Brooklyn
Bradley & Son, C. C., Syracuse
Ryerson & Son, Joseph T., Chicago

Hammers, Steam
Niles-Bement-Pond Co., N. Y. City

Handles, Machine
Rockwood Sprinkler Co., Worcester

Hangers, Shafting
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence
Jones Fdry. & Mch. Co., W. A. Chicago
Standard Pressed Steel Co.

Hardening
Bennett Metal Treating Co., Elmwood

Hardening, Case Hardening & Tempering
Meisel Press Mfg. Co., Boston

Hardening Compounds
Macalene Co., St. Cloud, Minn.

Hardness Testing Apparatus
Shore Instrument & Mfg. Co., N. Y.

Hobbing Machines
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Gear Cutting Mch.
Gould & Eberhardt, Newark
Meisselbach-Catucci Mfg. Co., Newark
Newark Gear Cut Mch. Co., Newark
Sommer & Adams Co., Cleveland

Hobs
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Greenfield Tap & Die Corp., Greenfield
National Tool Co., Cleveland
Newark Gear Cut Mch. Co., Newark
Philadelphia Gear Wks., Phila.
Union Twist Drill Co., Athol

Hoists and Cranes, Electric
American Eng. Co., Philadelphia
Link-Belt Co., Chicago-Phila.
Manning, Maxwell & Moore, Inc., N. Y. C.
Pawling & Harnischfeger Co., Milwaukee
Reading Chain Block Corp., Reading
Shepard Elec. C. & H. Co., Montour Falls

Hoists, Elec.
General Elec. Co., Schenectady

Hoists, Hand
Barrett-Cravens Co., Chicago
Canton Fdry. & Mch. Co., Canton
Ford Chain Block & Mfg. Co. Philadelphia.
Reading Chain Block Corp., Reading

Hoists, Pneumatic.
Chicago Pneu Tool Co., N. Y.
Ingersoll-Rand Co., N. Y. C.
Sullivan Mchy. Co., Chicago

Holders-On, Pneumatic
Chicago Pneu. Tool Co., N. Y.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester
Schieren Co., Chas. A., N. Y.

Hydraulic Machinery
French Oil Mill Mchy. Co., Piqua
Watson-Stillman Co., N. Y.

Igniters, Gas Engine
Doehler Die Casting Co., Brooklyn

Indicators, Speed and Test
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol
Veeder Mfg. Co., Hartford
Zina Goodell Corp., Salem

Jacks, Hydraulic
Watson-Stillman Co., N. Y.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago

Jigs and Fixtures
(See Contract Work)

Joints, Universal
Boston Gear Wks., Norfolk Downs
Dexter Co., L. H., Goshen
Fox Mach. Co., Jackson, Mich.
Gray & Prior Mach. Co., Hartford

Kettles, Soda
Brown & Sharpe Mfg. Co., Providence
Gray & Prior Mch. Co., Hartford

Keyseating Machines
Baker Bros., Toledo
Bucher-Smith Co., E. Liverpool
Davis Keyseater Co., Rochester
Lapointe Mach. Tool Co., Hudson
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson, Mass.
Mitts & Merrill, Saginaw.
Morton Mfg. Co., Muskegon Heights

Keys, Machine
Morton Mfg. Co., Muskegon Heights
Whitney Mfg. Co., Hartford

Lamps, Elect.
General Elec. Co., Schenectady

Lathe Attachments
Ames Co., B. C., Waltham.
Flather Co., Nashua
Rivett Lathe & Grinder Corp., Boston

Lathe Tools
Armstrong Bros. Tool Co., Chicago.
Gisholt Mach. Co., Madison.
Lovejoy Tool Co. Inc., Springfield, Vt.

Lathes, Automatic and Semi-Automatic
Fitchburg Mach. Wks., Fitchburg
Gisholt Mach. Co., Madison.
Jones & Lamson Mch. Co., Springfield, Vt.
National Acme Co., Windsor
Potter & Johnston Mch. Co., Pawtucket.
Pratt & Whitney, Hartford
Reed-Prentice Co., Worcester.
South Bend Lathe Wks., South Bend
Steinle Turret Mch. Co., Madison

Lathes, Bench
Ames Co., B. C. Waltham.
Blount Co., J. G., Everett.
Diamond Mch. Co., Providence
Greenfield Tap & Die Corp., Greenfield
Hjorth Lathe & Tool Co., Boston.
Pratt & Whitney, Hartford
Rivett Lathe & Grinder Corp., Boston
South Bend Lathe Wks., South Bend
Stark Tool Co., Waltham.

Lathes, Boring
Gisholt Mach. Co., Madison.
Potter & Johnston Mch. Co., Pawtucket.

Lathes, Chucking (See Lathes, Horizontal Turrett)

Lathes, Engine
American Tool Wks. Co., Cincinnati
Blount Co., J. G., Everett
Boye & Emmes Mach. Tool Co., Cincinnati
Bradford Mch. Tool Co., Cincinnati
Carroll-Jamieson Mch. T. Co., Batavia
Champion Tool Wks. Co., Cincinnati
Cons. Mach. Tool Corp., Rochester
Fitchburg Mach. Wks., Fitchburg
Flather Co., Nashua
Gisholt Mach. Co., Madison
Greaves Klusman T. Co., Cincinnati
Hamilton Mch. T. Co., Hamilton
LeBlond Mch. Tool Co., R. K., Cincinnati.
Lodge & Shipley Mch. T. Co., Cincinnati.
Monarch Mach. Tool Co., Sydney
Morris Mch. Tool Co., Cincinnati
Mueller Mch. Tool Co., Cincinnati
Niles-Bement-Pond, N. Y. C.
Oliver Mchy. Co., Grand Rapids
Pratt & Whitney, Hartford
Reed-Prentice Co., Worcester
Rockford (Ill.) Drilling Mach. Co.
Ryerson & Son, Jos. T., Chicago
Sidney Mach. Tool Co., Sidney
South Bend Lathe Wks., South Bend
Springfield (O.) Mach. Tool Co.
Wickes Bros., Saginaw

Lathes, Extension and Gap
American Tool Wks. Co., Cincinnati

Lathes, Gap
Carroll Mch. T. Co., A. V., Cincinnati

Lathes, Horizontal Turret
Acme Mach. Tool Co., Cincinnati
Dreses Mch. Tool Co., Cincinnati
Foster Mach. Co., Elkhart, Ind.
Gisholt Mach. Co., Madison.
Internat. Mch. T. Co., Indianapolis
Jones & Lamson Mch. Co., Springfield, Vt.
Pratt & Whitney Co., N. Y. City
Reed-Prentice Co., Worcester
South Bend Lathe Wks., South Bend
Steinle Turret Mch. Co., Madison

Lathes, Polishing (See Polishing and Buffing Machines)

Lathes, Speed and Hand
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Diamond Mch. Co., Providence
Garvin Machine Co., N. Y.
Greenfield Tap & Die Corp., Greenfield

Lathes, Spinning
Adriance Mach. Wks., Inc., Brooklyn

Lathes, Threading
Automatic Mach. Co., Bridgeport.
Rivett Lathe & Grinder Corp., Boston

Lathes, Toolroom
Pratt & Whitney, Hartford

Lathes, Vertical Turret
Bullard Mch. Tool Co., Bridgeport
Niles-Bement-Pond, N. Y. C.

Lathes, Wood Turning
Blount Co., J. G. Everett.

Letters and Figures
Brown & Sharpe Mfg. Co., Providence
Hoggson & Pettis Mfg. Co., New Haven.

Level Precision Machines, Aligning
Pratt & Whitney Co., N. Y. City
Universal Bor. Mach. Co., Hudson

Lighting Fixtures
General Elect. Co., Schenectady

Lubricants
Oakley Chemical Co., N. Y.
White & Bagley Co., Worcester

Machinists' Small Tools
Armstrong Bros. Tool Co., Chicago.
Brown & Sharpe Mfg. Co., Providence
Manufacturers Equip. Co., Chicago
Randall & Stickney, Waltham
Slocomb Co., J. T., Providence
Starrett Co., L. S., Athol.

Mandrels, Expanding
Brown & Sharpe Mfg. Co., Providence
Mfgrs. Equip. Co., Chicago
Nicholson & Co., W. H., Wilkes-Barre

Mandrels, Solid
Brown & Sharpe Mfg. Co., Providence
National Twist D. & T. Co., Detroit
Nicholson & Co., W. H., Wilkes-Barre
Pratt & Whitney Co., N. Y. City
Union Twist Drill Co., Athol

Marking Devices (See Stamps, Steel)

Marking Machines
Hjorth Lathe & Tool Co., Boston
Luma Elect. Equip. Co., Toledo
Noble & Westbrook Mfg. Co., Hartford

Measuring Machines
Norma Co. of America, N. Y.
Pratt & Whitney Co., N. Y. City

Metal Cleaning Equipment
Pangborn Corp., Hagerstown

Metal Stampings
Bossert Corp., Utica

Metal-Working Mchy.
Niagara Mach. & Tool Wks., Buffalo

Meters, Steam Flow
General Elect. Co., Schenectady

Micrometer, Bench
Pratt & Whitney Co., N. Y. City

Micrometer Calipers
Almond Mfg. Co., T. R., Ashburnham
Brown & Sharpe Mfg. Co., Providence
Randall & Stickney, Waltham
Slocomb Co., J. T., Providence
Starrett Co., L. S., Athol

Milling Attachments
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Garvin Mach. Co., N. Y.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
LeBlond Mch. Tool Co., R. K., Cincinnati.
Potter & Johnston Mch. Co., Pawtucket.
Reed-Prentice Co., Worcester
Rockford Milling Mch. Co., Rockford
South Bend Lathe Wks., South Bend
Whitney Mfg. Co., Hartford

Milling Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Ingersoll Mill Mch. Co., Rockford
Pratt & Whitney, Hartford
Rockford Milling Mch. Co., Rockford

Milling Machines, Bench
Ames Co., B. C., Waltham
Pratt & Whitney, Hartford
Hanson-Whitney Co., Hartford
Rockford Milling Mch. Co., Rockford
Stark Tool Co., Waltham

Milling Machine, Continuous
Cons. Mach. Tool Corp., Rochester
Ingersoll Mill. Mch. Co., Rockford
Potter & Johnston, Mch. Co., Pawtucket.
Pratt & Whitney, Hartford
Rockford Milling Mch. Co., Rockford

Milling Machines Die
Anderson Die Mch. Co., Bridgeport

Milling Machines, Duplex
Cincinnati (O) Milling Mach. Co.
Ingersol Mill Mch. Co., Rockford
Knight Mchy. Co., W. B., St. Louis

Milling Machines, Hand
Adams Co., Dubuque, Iowa
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Garvin Mch. Co., N. Y.
Pratt & Whitney, Hartford
Rockford Milling Mch. Co., Rockford
U. S. Mch. Tool Co., Cincinnati
Whitney Mfg. Co., Hartford

Milling Machines, Horizontal and Planer Type
Cons. Mach. Tool Corp., Rochester
Ingersoll Mill Mch. Co., Rockford
Niles-Bement-Pond, N. Y. C.
Reed-Prentice Co., Worcester

Milling Machines, Plain
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Garvin Machine Co., N. Y.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
LeBlond Mch. Tool Co., R. K., Cincinnati.
Potter & Johnston Mch. Co. Pawtucket
Reed-Prentice Co., Worcester
Rockford Milling Mch. Co., Rockford
Ryerson & Son, Joseph T., Chicago
U. S. Mch. Tool Co., Cincinnati

Milling Machines, Portable
Ingersoll Mill Mach. Co., Rockford
Underwood Corp., H. B., Phila.

Milling Machines, Thread
Foster Mach. Co., Elkhart, Ind.
Gisholt Mach. Co., Madison
Hall Planetary Thread Milling Mch. Co., Philadelphia
Rockford Milling Mach. Co., Rockford
Waltham Mch. Works, Waltham

Milling Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Garvin Mch. Co., N. Y.
Ingersoll Mill Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
LeBlond Mch. Tool Co., R. K., Cincinnati
Potter & Johnston Mch. Co., Pawtucket
Rockford Milling Mch. Co., Rockford
Ryerson & Son, Joseph T., Chicago
U. S. Mch. Tool Co., Cincinnati

Milling Machines, Vertical
Ames Co., B. C., Waltham
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Cons. Mach. Tool Corp., Rochester
Garvin Machine Co., N. Y.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee.
Knight Mchy. Co., W. B., St. Louis
LeBlond Mch. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., N. Y. City
Potter & Johnston Mch. Co., Pawtucket
Reed-Prentice Co., Worcester
Rockford Milling Mch. Co., Rockford
Van Norman Mach Tool Co., Springfield, Mass.

Milling Machines, Worm
Cleveland (O.) Auto. Mch. Co.
Pratt & Whitney Co., N. Y. City
Waltham Mch. Works, Waltham

Milling Tools, Adjustable Hollow
Geometric Tool Co., New Haven

Motors, Electric
Burke Electric Co., Erie
General Elect. Co., Schenectady
Masters Elec. Co., Dayton
Reliance Elec. & Eng. Co., Cleveland
Sturtevant Co., B. F., Boston
Westinghouse Elec. & Mfg. Co., E. Pittsburgh
Wisconsin Elect. Co., Racine

Nibbling Machines
Campbell, Andrew C., Bridgeport

Numbering Machines for Metal
Noble & Westbrook Mfg. Co., Hartford

Nut Tappers (See Bolt and Nut Machinery)

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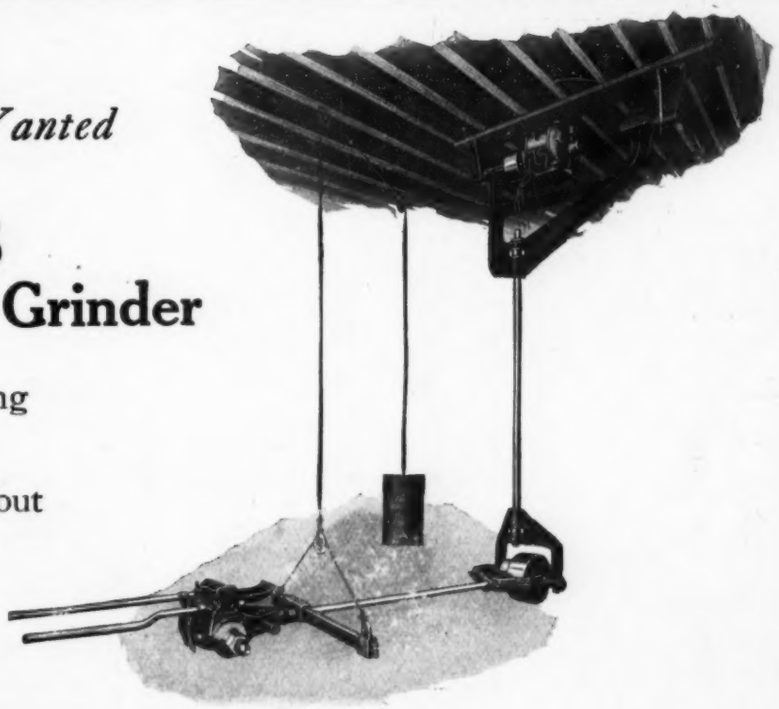

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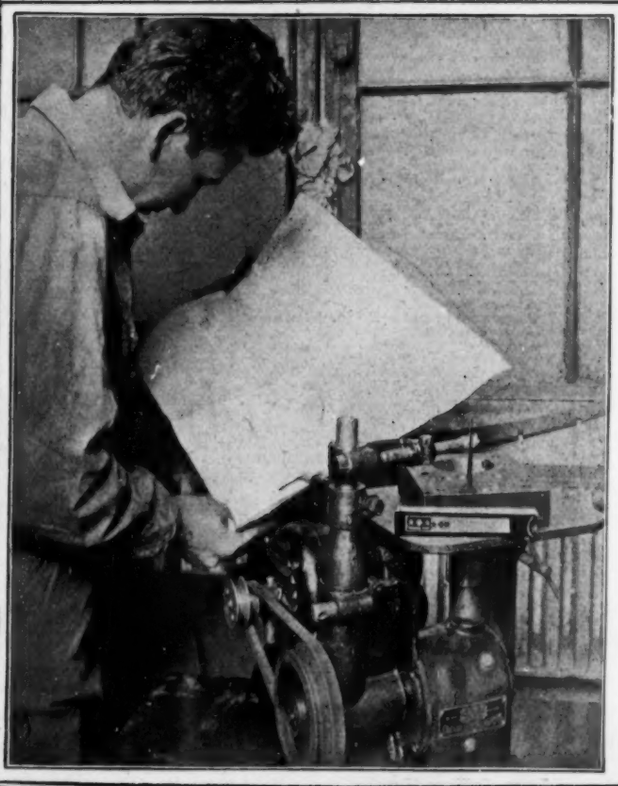

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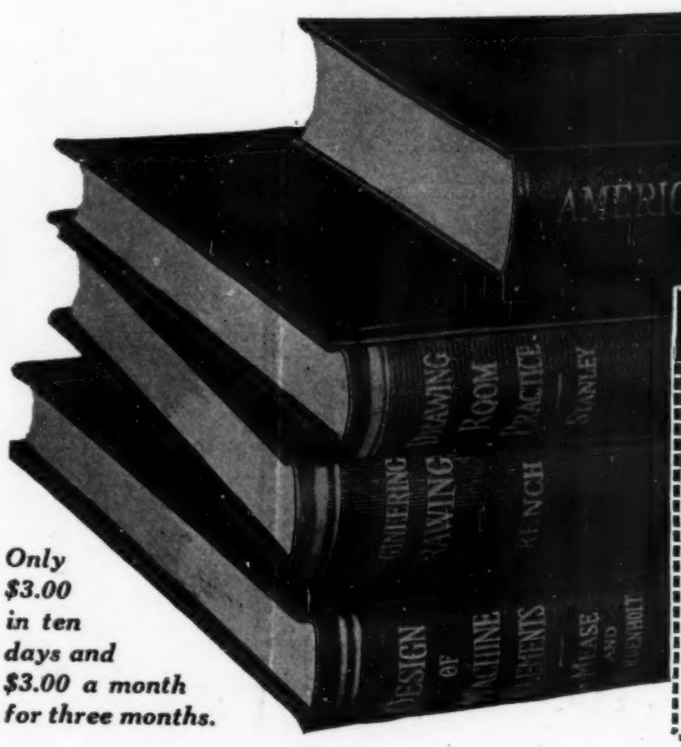

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